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SUMMARY OF RECENT ABSTRACTS*

VII. HELMINTHIASIS†

(Continued from p. 776)

Hookworm Infection: Strongyloides: Oesophagostomum

Hookworm infection is considered an occupational disease of miners and brickworkers in Italy, and De Maria and Beggi (p. 72) report that the question of extending the provisions to cover agricultural workers is still being considered. Fanci (p. 465) reports that hookworm infection is common in the Abruzzo region of Italy, and is associated with anaemia. The workers go barefoot and are ignorant of the elementary rules of hygiene. Larizza and Ventura (p. 761) remark that hookworm infection is spreading in Umbria, Italy, and relate the anaemia which develops in some subjects to the previous or resultant state of the iron reserves. They find no evidence of a toxic action of the parasite on blood or bone marrow, or that protein deficiency imposes any block on haemoglobin production, though they admit that this may occur in some tropical countries.

Oytun and Güralp (p. 749) note that *Necator americanus* is very much more prevalent than *Ancylostoma duodenale* in the Black Sea area of Turkey.

Nor El-Din (p. 72) reports on a hookworm survey of Iraq schoolchildren. In the Basra area the climatic conditions are very favourable for the spread of the infection, and in Baghdad the infection rates were inversely proportional to social status. Measures advocated for control involve surveys and mass treatment, and general sanitary improvement.

In Morocco hookworm infection is essentially an occupational disease almost confined to workers in the phosphate mines; Gaud (p. 184) discusses the subject, pointing out that the infection is not met in other mines, and suggesting reasons for this.

* The information from which this series of summaries has been compiled is given in the abstracts which have appeared in the *Tropical Diseases Bulletin*, 1959, v. 56. References to the abstracts are given under the names of the authors quoted and the pages on which the abstracts are printed.

† For previous articles on helminthiasis in this series see the August and September issues of the *Tropical Diseases Bulletin* each year since 1939.

CHARMOT and REYNAUD (p. 1163) investigated the incidence of hookworm infection in children with sickle-cell anaemia in Brazzaville, and observed that the exclusive existence of haemoglobin S seems to condition a partial resistance to hookworm infection. Children with only the trait did not show this resistance.

Hookworm infection is prevalent in coalminers in Taiwan, though it is mostly light; HUANG *et al.* (p. 1043) discuss this and other helminth infections in these workers, noting that *Ascaris* and *Trichuris* are also quite common.

In part of Shikoku, Japan, hookworm infection reaches an incidence of 30% in some rural areas; YANAGIHARA (p. 185) reports that a single dose of tetrachlorethylene eliminated the worms from two-thirds of the people treated. In some villages of Southern Kyushu, Japan, the incidence of hookworm infection rises as high as 59–69%, and it is commoner in mountain areas than lower flat places; both *A. duodenale* and *N. americanus* are involved, and YAMASHITA (p. 1259) suggests that infection by *A. duodenale* is largely acquired by mouth.

In an account of hookworm infection in Mexico HERNÁNDEZ VALLADOS (p. 331) shows that the number of deaths attributed to this infection has fallen compared with 30 years before. Incidence remains high in rural areas, and in youths and adults, but it is not an important cause of death. Poverty and poor environmental conditions are the important factors.

TASKER (p. 638) studied the nutritional anaemias of Malaya, finding evidence that hookworm infection was a factor, though not *Ascaris* infection. Malnutrition was not correlated with high hookworm rates. In an investigation of tropical iron-deficiency anaemia FOY *et al.* (p. 638) conclude that blood loss caused by 500–1,000 hookworms must often lead to anaemia when the margin of iron intake over iron requirements is narrow, as in many tropical countries. ROCHE *et al.* (pp. 1162, 1163) used a technique of radioactivity for labelling erythrocytes in a study of the anaemia of hookworm infection. Iron is lost through the worms, and is replaced from food taken, but when loss exceeds intake a lower level is reached in the blood, and this may proceed until the hookworms must take more blood for their own needs, and a vicious circle is established. Patients in such a state may be moribund, and in them transfusion is life-saving. The authors show that some intestinal iron from blood is reabsorbed.

SASA *et al.* (p. 332) describe a technique for cultivating faeces to yield infective larvae of hookworms, *Trichostrongylus* and *Strongyloides*, and show that this is superior to flotation, and much superior to direct smear, for diagnosis. TANAKA (p. 333) discusses this method and also a technique of extraction, in which larvae of *Strongyloides* are induced to pass from faeces through a wire mesh screen to the bottom of the dish; this is a useful method of diagnosis when speed is required. He infected himself with *Strongyloides*, and describes the clinical course of the infection.

MAGAUDDA-BORZI and PENNISI (p. 1044) used an antigen prepared from adult *A. duodenale* for the complement-fixation test in hookworm infection, with encouraging results ; the antigen needs to be perfected.

Hookworm infection is common in parts of French Guiana, and JUMINER (p. 550) assessed the value of various drugs in treatment. Tetrachlorethylene was the most effective, but was rather toxic; chenopodium was effective only in

mild infections, but did not require prolonged administration; diethylcarbamazine caused reduction in egg counts. From Brazzaville CHARMOT and REYNAUD (p. 957) discuss the treatment of hookworm infection in young children, concluding that although the ideal anthelmintic has not yet been discovered, tetrachlorethylene is at present the best for this infection, but one dose is not enough.

GOODWIN *et al.* (p. 639) investigated the treatment of hookworm infection with bephenium hydroxybenzoate, in persons of different ages in Ceylon. It was found to be as effective as tetrachlorethylene and did not cause the giddiness and nausea sometimes associated with tetrachlorethylene. It seems to be the drug of choice for marasmic children. It was also effective against *Ascaris*. YOUNG *et al.* (p. 750) used a bephenium salt (known as BW300C55, of which the composition is given) for the treatment of hookworm infection in a mental hospital, and think that it showed promise of being more effective than other drugs commonly employed; it acts also against *Trichuris*. ROGERS (p. 640) reports on the excretion of bephenium salts in the urine.

KARANDIKAR *et al.* (p. 858) have used hydrogen peroxide in hookworm and other intestinal worm infections; there were no serious ill effects, and worms were expelled by all the 20 patients, but the egg counts persisted.

Hookworm infection occurs throughout almost the whole of China, but in some parts transmission is seasonal. WANG (p. 857) describes methods used for treating nightsoil so as to kill the ova, and states that mass treatment with tetrachlorethylene or 1-bromo-2-naphthol (which is less toxic) is used, and that latrines and conservancy systems are being rapidly constructed; the result is that incidence has been much reduced.

BROWN and PERNA (p. 465) describe an overwhelming *Strongyloides* infection in which after death (probably from *Escherichia coli* septicaemia) filariform larvae were found in small branches of the pulmonary artery, in the alveoli and lymphatics, and in other organs. The massive larval invasion, especially of the lungs, would have contributed to death, and the migrating larvae could have carried *E. coli* repeatedly into the blood stream. ARTHUR and SHELLEY (p. 74) describe a distinctive variant of cutaneous larva migrans due to *S. stercoralis*.

WAGNER *et al.* (p. 544) report the results obtained with dithiazanine in various nematode and cestode infections; in hookworm infection the treatment was not successful, but *Taenia* sp. responded and there were some good results in *Hymenolepis nana* infections. Dithiazanine has been found valuable in *Strongyloides* infection (CERF, p. 859). BIAGI *et al.* (p. 1039) found it only moderately effective in *Trichuris* and *Ascaris* infections, but highly so in *Strongyloides* infection; results with hookworm and *Hymenolepis* were unsatisfactory. AMARAL *et al.* (p. 1151) show that dithiazanine was active against *Strongyloides*, *Trichuris* and occasionally *Ascaris*, but was inactive against hookworms and schistosomes.

FLOCH and MAILLOUX (p. 336) found desoxybenzoin useful in *Strongyloides* infection, but not in hookworm or *Ascaris* infection; other authors had found it valuable in schistosomiasis.

ASFORA and MARANHÃO (p. 959) observe that gentian violet alone does not give satisfactory results against *Strongyloides stercoralis*, and they used papain and hyaluronidase with it.

CHABAUD and LARIVIÈRE (p. 335) report that an immature female *Oesophagostomum stephanostomum* was removed from a subcutaneous nodule in a child at Dakar, and discuss the other species which have been found in man.

Ascaris Infection

In an account of the widespread helminth infection of the people of north-east Brazil PESSÔA (p. 1150) describes how he proved that *Ascaris* eggs may be spread by wind; this infection is very common in children. Schistosomiasis is also one of the great problems. ONO (p. 641) found that shore fish in Japan may be contaminated by human excreta, and this may involve their swallowing *Ascaris* eggs which might hatch out or be passed by them unchanged.

SORESCO and PANAITESCO (p. 335) investigated the hatching of *Ascaris* eggs in various media. SUGAWARA (p. 859) writes on methods for removing protein membranes of *Ascaris* eggs, and on staining methods.

HENGGELER (p. 859) refers to 3 outbreaks of evanescent pulmonary infiltration, with eosinophilia, in Switzerland, which were probably associated with *Ascaris* in garden soil. The illness is known locally as influenza and is not taken seriously. BIAGI *et al.* (p. 551) report that in a case of broncho-pneumonia with high eosinophilia, *Ascaris* eggs appeared in the faeces 3 months after onset; they comment that helminth infection should be considered in such cases, and that the search for larvae in the bronchial secretion may establish the diagnosis in the early stage. PIRINGER and MOTTA MONTES (p. 336) show that introduction of *Ascaris* filariform larvae into rabbits by gastric intubation produces eosinophilic pulmonary granulations. Very large doses may kill the animals, but very small doses fail to produce the pulmonary lesions.

AREAN (p. 551) studied the reaction of the rabbit liver to implanted *Ascaris* eggs, and compared the resulting lesions with those reported in human infections. THANNISCH (p. 186) describes a case of multiple abscesses of the liver due to *Ascaris*.

In Ceylon SINGHA (p. 1260) associates acute mesenteric adenitis with *Ascaris* infection, as a fairly common complication, and discusses diagnosis.

VAN RENSBURG and KARK (p. 187) and FERNANDO (p. 189) discuss the surgical problems of *Ascaris* infection, mentioning obstruction, intussusception, appendicitis, perforation, and invasion of the biliary and genito-urinary tracts. They note that some of these complications may follow administration of anthelmintic drugs, and they discuss treatment.

KOPPISCH and OLIVER-GONZÁLEZ (p. 959) immunized mice with human erythrocytes of various groups, and later injected an extract of the cuticle of *A. lumbricoides* intravenously into them. There was an agglutination effect of the extract on erythrocytes of mice which had been immunized with one group, which indicates a relationship between blood groups and pathological changes produced by infectious organisms.

MATSUMURA and YUGAMI (p. 1260) found that in animals infected with *Ascaris* the intradermal injection of *Ascaris* body fluid produced a local allergic reaction, and intravenously it produced anaphylactic shock. The phenomena hitherto believed to be due to a so-called *Ascaris* toxin are now believed to be allergic.

In experimental work on mice infected with newly hatched larvae of *Ascaris* PIKE (p. 1261) shows that piperazine citrate did not prevent the hatching larvae from invading the blood stream and lungs, when given shortly after infection, though it greatly reduced the numbers recovered from various tissues. When given 24 hours after infection it had no appreciable effect.

FRAGA DE AZEVEDO *et al.* (p. 1165) have used papain successfully in simple *Ascaris* infection, but it was much less effective if hookworms were present.

CHU (p. 186) writes favourably of the oxygen treatment of ascariasis in children; it is safe and simple, and is particularly effective in relieving partial intestinal obstruction due to the worms. He reports success in expulsion of the worms in 70% of his series. ALMICI and BONETTI (p. 545) report some success with this treatment for intestinal helminthiasis.

LIEN (p. 1164) describes a radiological technique for demonstrating *Ascaris* in the common bile duct. T'UNG and CHOU (p. 1165) have used acupuncture and traditional Chinese herbs for the treatment of biliary ascariasis.

MIURA *et al.* (p. 466) discuss the treatment of night soil by electrical heating for the destruction of *Ascaris* eggs (which was very successful) in Japan. Surplus midnight electrical power was used. No embryonated *Ascaris* eggs were found in ground fertilized by treated night soil, though they were found when untreated night soil was used. KAWAGOE *et al.* (p. 467) show that this technique, combined with mass administration of anthelmintics, was very successful in reducing the level of hookworm and *Ascaris* infection in a farming community.

BEAVER (p. 1262) discusses visceral and cutaneous larva migrans, pointing out that in the case of *Toxocara canis* the larvae often enter the central nervous system, or the eye, and in the eye a lesion tends to develop which resembles retinoblastoma and for which the eye may unnecessarily be removed.

Wuchereria bancrofti and W. malayi Infections

LAVOIPIERRE (p. 469) has published a review of previously published work on the behaviour of filarial larvae in their arthropod hosts.

WHARTON (p. 1168) describes a simple method of mounting and preserving filarial larvae; details are given in the abstract.

MANSON-BAHR (p. 1263) has published a very full account of the history of *W. bancrofti*, embodying the early work on the nematode itself, its transmission and the pathology of the disease. This review should be read in full.

LINARD (p. 1265) discusses the operative treatment of elephantiasis of the penis.

SIPAHIOGLU (p. 860) writes of the discovery of filariasis in the people of Alanya, Turkey.

JORDAN (p. 861) notes that infection rates with *W. bancrofti* in *Culex pipiens fatigans* are much higher if the entire mosquitoes are examined than if only the embryos in the proboscis are recorded. Epidemiological data on the infectivity of mosquitoes should be based on the infective forms found throughout the mosquito body; they are very mobile. He (p. 1264) reports investigations in Tanganyika which indicate that infection of *C. p. fatigans* with *W. bancrofti* results from lower levels of microfilaraemia than previously supposed, that mosquito infection is normal from microfilariae persisting after treatment with diethylcarbamazine, that advanced developmental stages in the mosquito are not affected by intake of the drug in a subsequent meal by the mosquito, and that in eradication programmes persons with few microfilariae in the blood should be included for treatment with diethylcarbamazine. He (p. 642) attempted to eradicate *W. bancrofti* from the inhabitants of an island in Lake Victoria by administration of diethylcarbamazine. The best results were obtained by giving 200 mgm. every month for 6–12 months, or, for those whose night blood showed microfilariae before treatment, for 18–24 months. Most of the microfilariae are killed by this treatment, but it is possible that there remains a hard

core of resistant larvae; these are important, since mosquitoes can be infected by very small numbers. Results were better in lightly affected than in heavily infected persons. Experimental work with infective larvae of *W. bancrofti* from *Culex fatigans* indicated that diethylcarbamazine in serum has no action on these larvae in the concentrations possible in treated persons (JORDAN p. 76).

HEISCH *et al.* (p. 960) made a filariasis survey on the island of Pate, Kenya, where *W. bancrofti* was found in 32% of the population of one village; mass treatment with diethylcarbamazine reduced this rate to about half. 7 filarial species were found in animals, including monkeys, dogs, cats, genets, donkeys and cows. The common mosquitoes in houses were *Aëdes pembaensis, Aëdes aegypti* and *C. p. fatigans*; feeding preferences and filarial infection rates of these are discussed. After the diethylcarbamazine campaign the infection rate of *C. p. fatigans* fell from 25% to 6·6%, but the other mosquitoes were not affected. *W. bancrofti* developed well in *C. p. fatigans*, and it was possible to distinguish most of the infective larvae in mosquitoes; *C. p. fatigans* contained only *W. bancrofti*, and *Aëdes pembaensis* only animal filariae.

TOUMANOFF (p. 1263) discusses the transmission of filariasis in part of Lower Guinea, where *W. bancrofti* and *D. perstans* are found. Filarial larvae were found in *Mansonia uniformis* and *Anopheles gambiae*, which both took most of their blood from man. In comment Laurence points out that the presence of animal filariae cannot be ruled out.

BRYGOO (p. 337) discusses human filariasis in Madagascar which has been ascribed to *W. bancrofti* or a variety whose adult is not known but whose microfilaria has been described under the name of *Microfilaria bancrofti* var. *vauceli*. Anophelines and *Mansonia uniformis* are the vectors, but the role of *C. p. fatigans* seems to be negligible.

In Mangalore, Madras State, the peak of density of *C. p. fatigans* occurs after the rainy season, and the peak filarial infection rate in this mosquito is found when relative humidity is highest, during the monsoon months (SUBRAMANIAM and TAMPI, p. 190). GUJRAL (p. 468) and SUBRAMANIAM *et al.* (p. 468) report on filariasis (*W. bancrofti*) in part of Uttar Pradesh and the Laccadive and other islands of Madras State. In part of Bombay State where *W. bancrofti* infection is common, antilarval measures and residual spray with DDT were not successful in control, and a mass treatment campaign with diethylcarbamazine was therefore tried, but PATEL and PARANJPEY (p. 751) report that only one-third of the people took advantage of it.

In Singapore DANARAJ *et al.* (p. 337) found *W. bancrofti* infection in 5·5% of people examined; infection was found in 1·6% of *C. p. fatigans*.

Filariasis exists in China, and both *W. bancrofti* and *W. malayi* are involved; 20–30 million people are affected, and LI (p. 861) comments on diagnostic methods, transmission and treatment with diethylcarbamazine, which is moderately successful. Vector control varies with season and involves the use of BHC and DDT. From observations made in China WANG *et al.* (p. 339) conclude that the periodicity of microfilariae of *W. bancrofti* is related to their size; the average size of those which appear in the daytime is smaller than that of those appearing at night. The size of the pulmonary vessels is therefore relevant, and they found that the number of microfilariae in the peripheral blood diminished after vago-depressive atropine, and increased after pilocarpine and acetylcholine which are vago-stimulative. It is known that the vagus is more

active in sleep than the waking state. In comment Buckley suggests work on non-periodic *W. bancrofti*, and on *L. loa*, to verify the theory.

OMORI (p. 1264) shows that larvae of *W. bancrofti* in *C. p. pallens* are killed by the low temperatures experienced during hibernation in Japan.

In a survey of the distribution of filariasis in Brazil RACHOU (p. 338) points out that *W. bancrofti* was introduced from Africa; infection and transmission are localized and mainly coastal, infection being mostly under 1% but rising to 14% in places; it is mainly urban, the vector being *C. fatigans*. *Mansonella ozzardi* is indigenous and is found mainly in the Amazon region with rates of 10–20%; it is rural rather than urban. The mean weight of blood ingested by *C. p. fatigans* is calculated by RACHOU *et al.* (p. 469) as about 3·21 mgm. In Brazil *C. p. fatigans* is resistant to the chlorinated hydrocarbon insecticides, and RACHOU (p. 470) points out that the complexity of breeding places precludes antilarval measures. Control is therefore based primarily on diethylcarbamazine, and there is an indication that this may be efficient for the purpose, though other methods, including improvements in standards of hygiene, should be added where possible. After extensive investigation RACHOU and SCAFF (p. 1169) recommend treatment of the whole population with a single dose of 6 mgm. diethylcarbamazine per kgm., whether infected or not, every 6 or 12 months.

IYENGAR (p. 1166) gives an account of filariasis in Netherlands New Guinea, which is due to the periodic form of *W. bancrofti*. He lists the vectors, noting that where they are anophelines, malaria also exists; but anophelines are not as effective as culicines in giving the repeated infections which are associated with elephantiasis. Antimalarial work affects the anopheline vectors, but areas where culicines are the chief vectors do not necessarily come within the scope of antimalarial measures. Intense transmission occurs near swamps, and drainage or removal of the people to village sites well away from breeding places may be necessary, but this would be difficult from the social point of view. Mass diethylcarbamazine monthly for 5 years may be an alternative. In Netherlands New Guinea DE ROOK and VAN DIJK (p. 1167) have found fully grown larvae in several culicine species, of which the most important are believed to be *Culex annulirostris*, *Mansonia* and *C. p. fatigans*.

IYENGAR (p. 75) reports on a filariasis survey of Niue, where the non-periodic form of *W. bancrofti* is transmitted by a local form of *Aëdes tongae*. Incidence is not high, probably because the local rats do not damage coconuts (and therefore do not multiply breeding places) and because transmission is severely restricted when breeding places dry up; moreover, since 1955 the administration of diethylcarbamazine has been enforced. In Tahiti *Aëdes polynesiensis* breeds largely in rat-eaten coconuts, and also in other sites including tree holes, crab holes, fresh-water containers, car tyres, cans, bottles and other small collections; BONNETT and CHAPMAN (p. 342) comment on resistance to desiccation shown by the eggs, and on control measures against small collections of water near human habitations.

In part of Malaya the microfilariae of *W. malayi* have nocturnal periodicity, in other parts they are semi-periodic, and WILSON *et al.* (p. 551) show that these two forms differ in other characteristics also, including their usual insect hosts. EDESON and WHARTON (p. 191) report that in Malaya *W. malayi* has been shown to develop in a monkey, a domestic cat and a slow loris, and the evidence

suggests the existence of an animal reservoir of *W. malayi* in East Pahang, and complete control will therefore be difficult. The problem is complicated by the fact that another species, *W. pahangi*, is found in forest and domestic animals in the same area, and both *W. malayi* and *W. pahangi* develop in *Mansonia longipalpis*, which confuses the findings in mosquito dissections. In discussion Buckley suggested that these two species, and one from East Africa, should be removed from the genus *Wuchereria*, and that a new genus should be erected for them.

LAING (p. 862) has found microfilariae resembling those of *W. malayi* in 17 of 20 dusky leaf monkeys (*Presbytis obscurus*) in Malaya, and also adult worms indistinguishable from *W. malayi* in 16. Previous records from *Presbytis melalophos* may have been due to wrong identification of the monkey. EDESON and BUCKLEY (p. 1171) have studied the migration and rate of growth of *W. malayi* in experimentally infected cats.

From Malaya TURNER (p. 862) gives a comprehensive account of the clinical features of filariasis due to *W. malayi*. In 60 patients fever, adenitis and lymphangitis were common, but a large number of carriers are apparently unaffected by these parasites. Diagnosis rests on blood examination for which 60 cmm. should be used; daytime blood may not show the periodic form of *W. malayi*. Intradermal tests with *Dirofilaria* antigen are not specific, and complement-fixation tests have little value.

In Malaya WHARTON *et al.* (p. 191) found that weekly and monthly administration of diethylcarbamazine reduced the microfilaria rate but did not eliminate the parasites, whereas spraying with dieldrin did not influence human infection. These measures did not change the infection rate of *Mansonia longipalpis* or its biting density. Both *W. malayi* and *W. pahangi* are present in the district, and cannot be distinguished in the mosquito, and there may also be a reservoir of infection in domestic and forest animals.

NAIR and ROY (p. 1170) report a filariasis survey of part of Kerala State, India, where *W. malayi* is the parasite and infection is common. Almost all the houses have ponds overgrown with *Pistia stratiotes*, in which the vector *Mansonioides* species breed readily. In the same State KRISHNAN *et al.* (p. 190) compared DDT, malathion and diazinon for the control of the local mosquitoes, including *Mansonia*; DDT was more effective than the others.

ANTONIPULLE *et al.* (p. 340) discuss the biology and control of *Mansonia uniformis*, noting that it develops in association with many genera of plants besides *Pistia* and *Salvinia*, especially on the grass *Isachne australis*, which is common in both cultivated and uncultivated ricefields in Ceylon.

LAURENCE and SMITH (p. 469) have devised a technique for the breeding of mosquitoes of the subgenus *Mansonioides* in the laboratory, which has proved very successful. Details should be sought in the original.

In Southern China FENG *et al.* (p. 341) observed 2 races of *A. hyrcanus* var. *sinensis*, one of which is small and anthropophilic, the other larger and zoophilic. Both are able to transmit *W. malayi*, but the smaller race is the more important. They breed in terraced ricefields.

In the *Chinese Medical Journal* (p. 864) it is stated that a single dose of diethylcarbamazine at night was enough to cure 90–96% of subjects with *W. malayi* infection in Fukien, as judged by observation for 3 months, but in comment Walters suggests that since the drug acts on the adult reproductive organs

of the filariae, immature worms may escape its action, and that the results of single-dose therapy should be assessed one year after treatment.

DANARAJ *et al.* (p. 1061) found the complement-fixation test, with an antigen prepared from *Dirofilaria immitis*, positive in 95% of persons with eosinophilic lung, but much less commonly in controls, and observed that the titre diminished after treatment with diethylcarbamazine. They suggest that this sensitivity to filarial protein supports the view that the disease may be due to filarial infection, not necessarily of human origin.

BERTRAM (p. 1266) in discussing cotton-rat filariasis points out that prolonged exposure to reinfection resulted in heavy infection but with few or no microfilariae in the blood—which means that the continuity of transmission was disrupted. When exposure to reinfection was intermittent there was considerable infection with adults, but microfilariae were numerous in the blood and persisted for long periods, and transmission was therefore assured. Variations between these extremes occurred, and the results suggest that in other filarial infections, transmission which is seasonal may have an important bearing on epidemiology.

Onchocerca Infection

KIRK (p. 1045) has published a short but comprehensive account of African onchocerciasis and KIRK *et al.* (p. 1171) give an account of the disease in the Sudan, where it is common in some parts, though as yet incompletely mapped. They do not agree with the pessimism which has been expressed on the subject of entomological control, and they think that even partial control may be valuable in preventing blindness by reducing the intensity of infection, a conclusion with which Waddy, in comment, agrees.

CROSSKEY and CROSSKEY (p. 1266) in Northern Nigeria observed in young people that the inoculation rate and intensity of infection with *O. volvulus* varied inversely with distance of residence from potential sources of infection, in a degree which, as calculated by Macdonald, would produce extinction of risk at about 13 miles.

In a booklet on onchocerciasis in French Equatorial Africa the Comité de l'Entente Française (p. 1172) give an account of the incidence and complications of the disease—11·28% of persons examined had ocular lesions, many of them in the retina, optic nerve or lens. Treatment and control measures are discussed. In Liberia MILLER and FRANZ (p. 471) found *O. volvulus* in 69% of subjects studied by examination of multiple skin scarification smears, and in 100% of those over 40 years old; no ocular lesions were found. They discuss the question of ascribing to *O. volvulus* the various skin lesions found.

DUKE and BEESLEY (p. 342) show that female *S. damnosum* bites mostly those parts of the human body immediately above the substrate on which the body rests, but that occupations in which a man comes into association with *Simulium* among waist-high vegetation, or in water, may mean a higher proportion of bites on the upper parts of the body, and earlier invasion of the eyes by microfilariae.

LEWIS (p. 77) is able to distinguish nulliparous from parous *Simulium damnosum*, which saves time in examining flies for larvae of *O. volvulus*, and notes that in one part of Northern Nigeria the infection rate in flies was about 2%. In the same area CROSSKEY (p. 78) observed that older flies tend to bite more in the middle part of the day. Nulliparous flies have abundant fat body, and are

heavier than parous flies [but in the original abstract their weights are given in gm., in mistake for mgm.].

ISRAEL (p. 1267) observed that onchocercal nodules often contain dead and disintegrating worms, even if there has been no treatment with Antrypol. He suggests that the healthy worms lie free in the tissues, and that nodules are the response to dead worms—a suggestion not accepted by Kershaw. Adenolymphoceles (" hanging groins ") are appendages hanging from the groin area and are connected with onchocerciasis. CHERRY (p. 1046) describes the condition and attributes it to enlargement of the femoral and inguinal glands in heavily infected persons, with consequent lymph stasis.

RODGER (p. 865) examined eyes from patients with onchocerciasis and traces the route commonly taken by the microfilariae in this region; he claims that they commonly travel from the bulbar conjuctiva into the cornea between the epithelium and Bowman's membrane, and that they traverse the adventitial sheaths of the perforating vessels at the limbus and the equator, and perhaps of the nutrient vessels to the optic nerve. He reproduces photographs of microfilariae in retina, vitreous and optic nerve. In comment Choyce states that the microfilariae cannot absolutely be recognized as those of *O. volvulus*. BUDDEN (p. 553) discusses the question of ocular lesions and onchocerciasis, and dissents from the view that the anterior segment lesions are unimportant, and that the fundus lesions ascribed to onchocerciasis are due to other causes. TORROELLA and LAUGRAULET (p. 78) report that onchocerciasis is common in a coffee-growing area of Mexico, and that ocular lesions, including lesions of the fundus, are fairly common; the lesions were chronic, and no acute lesions were found in the 137 onchocerciasis subjects examined. VAN DEN DORPE (p. 643) writes on ocular onchocerciasis in the Kasai Province of the Belgian Congo.

The larvicide of choice for use against *Simulium* larvae in Africa is DDT in a non-toxic solvent oil, and D'AUBENTON and BLANC (p. 961) observed that a concentration of 1 mgm. per litre would kill these larvae, but was also toxic to fish fry. Rivers should not, therefore, be treated in the fish-breeding season, which is early in the rains, and since little can be done in the African savannahs during the dry season, the only satisfactory period is at the end of the rains. In part of Northern Nigeria CROSSKEY (p. 555) attempted to control *S. damnosum* by treating river tributaries wih DDT once each week for 12 weeks. There was great reduction in the numbers of flies for up to 23 miles below the treatment points, but they returned within 6 months. Control by larvicides is possible in non-isolated foci, but the treatment needs to be repeated each year in view of the rapid re-invasion which takes place.

NELSON and GROUNDS (p. 77) examined the people of Kodera, Kenya, where Garnham and McMahon eradicated the vector of onchocerciasis in 1946. Although there has been no transmission since then, and no infection has been found in children born since 1946, onchocerciasis remains a major clinical problem in the older people, in whom nodules and microfilariae are still found. It is evidently not enough to eliminate the vector; heavily infected persons should be treated.

Loa Infections: Mansonella

DUKE and WIJERS (p. 197) in the Cameroons have established the fact that infections with a form of *Loa* are found in certain monkeys; this is large and

shows nocturnal periodicity. The human *Loa* can be transmitted by *Chrysops silacea* to a mandrill; it is small and maintains its diurnal periodicity. In natural conditions transmission of *L. loa* from man to monkey rarely occurs, and the monkey population is of no practical importance as a reservoir of human infection.

VAN BOGAERT *et al.* (p. 198) describe a case in which *Loa loa* was found in the cerebrospinal fluid.

GONZALES-MUGABURU (p. 1045) reports cases of *Mansonella ozzardi* from Peru, for the first time.

Trichinella Infections: Trichuris; Enterobius, etc.

FLATMARK (p. 80) reports that trichinosis is still quite common in certain Norwegian mammals, but is rare in man because the level of general hygiene is high, and there is strict control of swine and rats, and the disease is watched for in fur-producing and other domestic animals.

POPOVIC *et al.* (p. 754) report epidemics of trichiniasis in Yugoslavia, and relate them to the consumption of uncooked cured meat from sows fed in villages and forests, where they probably became infected by eating wild carnivorous rodents. PASCU *et al.* (p. 754) report an outbreak of trichiniasis in Rumania, giving an account of the symptoms and signs. SIEDLECKI (p. 1047) found *Trichinella* in 13·5% of human bodies examined in part of Poland, though no symptoms had been recorded. JEZIORANSKA and BARCISZEWSKI (p. 963) discuss various immunological reactions in trichiniasis as tested during an epidemic in Poland.

ZIMMERMANN and his colleagues (pp. 81, 866, 1268) found trichiniasis in 10% of dogs and 6% of cats examined in Iowa, and discuss its incidence in wild life; they investigated the faecal transmission of *Trichinella*.

LABZOFFSKY *et al.* (p. 1268) have isolated 7 antigenic fractions from *Trichinella* larvae.

SUESSENGUTH and BAUER (p. 1269) report on the results of the Suessenguth-Kline test for trichiniasis on a large number of blood specimens.

In experimental work on mice WARDA (p. 1173) found that piperazine compounds, given for 6 days beginning on the second day of infection, have a strong action on adult male *Trichinella* but a much weaker action on the females.

VOSTA (p. 736) reports a great increase in the incidence of *Trichuris* and *Hymenolepis nana* infections in a children's mental home in Czechoslovakia; the sewage effluent from the hospital was not treated before discharge, and sediment from the settling tank, which contained helminth eggs, was used for manuring the kitchen gardens of the hospital.

PAINE *et al.* (p. 644) write very favourably of dithiazanine in trichuriasis which they used in a few patients, and PARAVISSINI *et al.* (p. 1267) found it very effective in the same infection. After examination of the eggs of *Trichuris* from patients treated with dithiazanine, which show great abnormalities, MAZZOTTI *et al.* (p. 645) conclude that the drug causes the worms to expel the eggs already formed and in the uterus, and that the worm is then incapable of normal ovulation. Courses of dithiazanine, lasting 5 days, were given by YOUNG *et al.* (p. 752) to mental patients, and the effectiveness of the drug on *Trichuris* infections was confirmed; there was only a moderate effect on hookworm infection.

SOKOLINSKY (p. 1268) writes favourably of intrarectal oxygen and diathermy for *Trichuris* infection in children.

In the treatment of *Enterobius* infection both diethylcarbamazine and tetracycline proved disappointing, and SHAH and MODI (p. 866) therefore tried them together, but the results were no better.

YAMANAKA (p. 79) discusses the mechanism by which *Gnathostoma spinigerum* causes the transient localized oedema which is a feature of this infection; a metabolic product, on excretion, is probably involved. IRIE (p. 343) reports studies on *G. spinigerum* in cats and dogs in Japan, and in the second intermediate hosts. BABERO and SHEPPERSON (p. 643) have found *G. spinigerum* in a raccoon and in a snake (*Agkistrodon piscivorus*) in the United States.

LEE and PARMELEE (p. 197) describe 3 cases of *Thelazia* infection of the eye in the United States. *Charles Wilcocks*

MALARIA

In this section abstracts are arranged as far as possible in the following order:—Human malaria—*epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control;* Animal malaria—*monkeys, other animals, birds.*

LIPS, M. Anophèles du Congo Belge. 2. Quelques espèces des galeries forestières. [**Anophelines of the Belgian Congo. 2. Some Species from the Forest Fringe**] *Riv. di Parassit.* Rome. 1960, Mar., v. 21, No. 1, 39–64, 1 map. [Numerous refs.]

The English summary appended to the paper is as follows:—

"This second part of the survey of the Anopheles from the fringing forest in the Belgian Congo concerns Anopheles *concolor, dureni, implexus* and *mortiauxi.*

"A review of the earlier collectings and observations with numerous references, is given.

"At the present time, these Anopheles cannot be incriminated as human malaria vectors in this country.

"Many errors about *A. dureni* call for correction. The new name of *Anopheles dureni* var. *millecampsi* 1960 is proposed to design the *A. dureni* of the Katânga Province.

"A distribution table and an ecological map are added."

[See this *Bulletin*, 1960, v. 57, 98.]

ABDEL-MALEK, A. A. **The Anopheline Mosquitoes of Northern Syria.** *Bull. Soc. Entom. Egypte.* 1958, v. 42, 519–35, 4 figs. [16 refs.]

"A survey for the study of the distribution and biology of the *Anopheles* species present in Syria north of Homs Governorate up to the Mediterranean coast to the west, the Turkish frontiers to the north and the Iraqi boundaries

to the east, is the basis of this paper. New records of distribution and biological notes are given for the larvae and adults of the six *Anopheles* species encountered, namely *A. sacharovi, A. superpictus, A. hyrcanus, A. pulcherrimus, A. claviger* and *A. algeriensis*. Adults of *A. pulcherrimus* were encountered in Syria for the first time. Simple keys for the identification of the anopheline adults and larvae so far recorded from Syria are devised."

[See also LEESON, this *Bulletin*, 1951, v. 48, 103.]

SOUTH PACIFIC COMMISSION. Noumea, New Caledonia. **Fish Pond Mosquito Breeding and Malaria.** *Technical Information Circular No. 37.* 1960, Jan., mimeographed pp. 1–2. **Notes on the Breeding of Mosquitoes in Fishponds in Netherlands New Guinea** [VAN DIJK, W. J. O. M.]. *Ibid.*, 3–8.

AL-DABAGH, M. A. **Mechanisms of Death and Tissue Injury in Malaria. 2. Anoxia.** *J. Facul. Med. Baghdad.* 1960, Apr., v. 2 (n.s.), No. 2, 70–77. [Numerous refs.] **3. Secondary Shock.** *Ibid.*, 78–83. [25 refs.]

TELLO, E. E. La acción "Cortisona-Like" del Camoquín. [**The Cortisone-Like Action of Camoquin**] *Rev. Facul. Ciencias Med.* Cordoba. 1959, Oct.–Dec., v. 17, No. 4, 297–301, 3 graphs.

The English summary appended to the paper is as follows:—

"The author wanted to establish whether Camoquin, like other drugs, stimulates the suprarenal capsules in some way, causing an eosinophile-depressant effect.

"In 23 patients a fasting eosinophile blood count was carried out at 4, 8 and 24 hours after the oral administration of 2 tablets of Camoquin, finding in almost all the samples eosinopenia.

"No distinctions were made regarding dermatosis, age, sex, or the patient's condition. Neither did the laboratory techniques depart from the routine procedures.

"These provisory results make it evident that Camoquin, besides the effects described by other authors, possesses a stimulating action on the suprarenals, which begins at least 4 hours after the drug's administration, reaches its peak at 8 hours and continues for 24 hours."

DRAPER, C. C. **Effect of Malaria Control on Haemoglobin Levels.** *Brit. Med. J.* 1960, May 14, 1480–83, 1 fig. [17 refs.]

In the plains of the Taveta-Pare region of Kenya and Tanganyika, dieldrin spraying of all African huts was begun in 1955, and the 6th and final spraying was made in 1959. *Plasmodium falciparum* malaria was endemic, but by 1959 the spleen and parasite rates at all ages had fallen precipitously in all age-groups; for example, the parasite rate at age 2–4 years fell from 86% to 5%. Haemoglobin levels rose progressively. A mean Hb level of 10·4 gm./100 ml.

at age 2–4 years in 1955 rose to 12·2 in 1959; for males aged 10–14 the rise was from 12·0 to 13·1, for females of this age from 12·3 to 13·2; and similar improvement took place at all ages.

However, anaemia was still common, especially in children and young women. 23 schoolchildren whose mean Hb level was 10·9 ± 0·7 gm./100 ml. were given 1 gm. of ferrous sulphate by mouth for a month; their mean Hb had then risen to 12·3 ± 1·6 gm./100 ml.

How far endemic malaria contributes to the anaemia of tropical populations is debatable, both on the grounds of the theory of this relationship and on those of experience. Both these aspects are discussed with reference to the literature, but the practical lesson from this eradication experiment seems clear: haemoglobin levels in general rise when malaria is controlled, some part of this rise being due to improved living standards; but in some children (and in females during the reproductive period) there may remain some anaemia, probably due to iron deficiency.

[See also this *Bulletin*, 1957, v. 54, 389; 1958, v. 55, 683, 684; 1959, v. 56, 511.]

Alan B. Raper

ELLIOTT, R. **Insecticide Resistance in some *Anopheles* Larvae.** *Indian J. Malariology.* 1959, Mar., v. 13, No. 1, 7–11, 2 graphs.

Concentration mortality data for larvae and adults of susceptible and resistant strains of various anopheline species have been compared. The author suggests that "Since the same physiological mechanisms may be expected to operate throughout the life history of the resistant or susceptible mosquito, some correlation between adult and larval levels of susceptibility may be looked for". He suggests also that the correlation may be expressed arithmetically as follows:—

$$\frac{\text{LC50 [p.p.m.] R larvae}}{\text{LC50 S larvae}} = K \frac{\text{LC50 [\%] R adults}}{\text{LC50 S adults}}$$

The values obtained for K for *Anopheles gambiae*, *A. sundaicus* and *A. stephensi* were 2·7, 2·85 and 1·82, respectively. No correlation was definitely established but, in view of the predictive value of such a formula, the author hopes that "further figures may be forthcoming".

B. C. Fine

RAHMAN, J., ROY, M. L. & KULDIP SINGH. **Development of Increased Tolerance to D.D.T. in *A. culicifacies* Giles in the Panch Mahal District of Bombay State (India).** *Indian J. Malariology.* 1959, June–Sept., v. 13, Nos. 2/3, 125–30, 3 charts.

Dwellings in the district concerned have been repeatedly sprayed with DDT since 1950, at first thrice yearly at 56 mgm./sq. ft. and latterly (usually) twice yearly at 112 mgm./sq. ft. In 1959 it was noted that transmission of malaria, at a low level, was occurring. Susceptibility tests of *Anopheles culicifacies* were made by the WHO method and compared with earlier data (for Bombay State and elsewhere) [see, for example, this *Bulletin*, 1958, v. 55, 484]. Results of the 1959 tests gave LC50 values of 2·05 to 2·2%, as compared with 0·84% for 1958 and 0·19 to 0·6%, at various places, between 1956 and 1957. It appears that

the susceptibility to DDT of the mosquito is gradually declining. Simultaneous measurements of dieldrin susceptibility gave no indication of increased tolerance to that insecticide (though dieldrin resistance has been reported in another district: PATEL *et al.*: unpublished report to WHO).

[The straight dosage-mortality curves for DDT shown suggest that the change is of the type described as "vigour tolerance", rather than an early stage of true resistance.] *J. R. Busvine*

WEINBURGH, H. B. & FAY, R. W. **Colonization and Production of a Dieldrin-Resistant Strain of** *Anopheles quadrimaculatus* **Say.** *J. Econom. Entom.* 1960, Feb., v. 53, No. 1, 101–3.

"A dieldrin-resistant field strain of *Anopheles quadrimaculatus* Say from Cleveland, Mississippi, has been established under insectary production. Three-day-old females show high dieldrin resistance; 60-minute exposures to 0·8% through 8% dieldrin-Risella oil papers result in less than 10% mortality in 24 hours, while 480-minute exposures to 4% papers killed only 50%. Susceptible females are killed by 60-minute exposures to 1·6% dieldrin-Risella oil papers."

VARGAS, L. & AMARAZ UGALDE, A. Observaciones sobre la epidemiologia del paludismo en México. [**Observations on the Epidemiology of Malaria in Mexico**] *Salud Pública México.* 1960, Jan.–Mar., v. 2, No. 1, 39–81, 16 graphs.

A previous report brought the account of the measures for the eradication of malaria in Mexico up to June 1959 [this *Bulletin*, 1960, v. 57, 451].

This paper gives the full findings for the year 1958 in great detail and these are set out in tables, maps and figures. The distribution of cases in terms of States and municipalities, age, sex, and control zones are shown. The results of control operations and of blood examinations are set out and discussed and the relation of malaria to other causes of disease and death is also discussed. Malaria formerly accounted for some 6% of all causes of death, but by 1957 this figure had fallen to 1·3%.

The very complete findings provide full information for all those who require to study the results in detail. *H. J. O'D. Burke-Gaffney*

VARGAS, L., ROMÁN Y CARRILLO, G. & DÍAZ NÁJERA, A. Nuevas técnicas para estudiar la susceptibilidad de artrópodos a insecticidas persistentes. I. Pruebas en 4 especies anofelinas mexicanas criadas en el laboratorio basadas en el tiempo de caída definitiva de los ejemplares. [**New Techniques for Studying Susceptibility of Arthropods to Insecticides. Tests of 4 species of Mexican Anophelines based on Definitive Knock-Down Time**] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1959, Mar., v. 19, No. 1, 19–65, 14 graphs. English summary (8 lines).

Blood-fed female mosquitoes were released into a cubical chamber, previously treated with xylol solutions of insecticide to give deposits of 2 gm. DDT and of

0·6 gm. dieldrin per square metre. About 100 mosquitoes were released per experiment. Dying mosquitoes were then removed at 5-minute intervals until none remained. Experiments lasted from 35 minutes to 2¾ hours, depending on the susceptibility of the insects. The counts provide distribution curves of knockdown against time in minutes. These data are shown graphically and in numerous tables, and mathematical treatment suited to their characteristics is formulated. The method was tested with *Anopheles aztecus*, *A. albimanus*, *A. punctipennis* and *A. quadrimaculatus*. There is some discussion of practical advantages of this technique over the standard WHO test for assessing resistance of mosquitoes to an insecticide. *D. S. Bertram*

De Bustamante, F. M. Considerações sôbre certos problemas especiais relacionados com a erradicação da malária no Brasil. **[Some Special Problems of Malaria Eradication in Brazil]** *Rev. Brasileira Malariologia.* Rio de Janeiro. 1959, Jan., v. 11, No. 1, 9–17. [21 refs.]

The malaria vectors of Brazil are neither exclusively exophilic, like *Anopheles bellator* in Trinidad, nor entirely endophilic, like *A. darlingi* on the coast of British Guiana. Instead, they seem to be variable in habit in different parts of the country, thus posing different problems of malaria control.

A. aquasalis is simple to control. In the area where it is essentially endophilic (in the north-east), it is easily controlled by DDT house-spraying to suppress transmission. In other areas, where it is more exophilic, it appears to bite man rarely. The situation is rather similar with *A. albitarsis*, a widely distributed mosquito, mainly zoophilic except in the coastal zone. It is not an efficient vector and is readily controlled by DDT house-spraying, where necessary.

A. darlingi, a vector of considerable importance, is numerous and exophilic in the Amazon basin, which was probably its original home. On the periphery of its distribution, it becomes essentially endophilic, and here it is best controlled by DDT house-spraying. One result of this is of interest. House-spraying from 1946 to 1955 resulted in this mosquito being very rare in houses. Subsequently, spraying was stopped in some areas, but the mosquitoes continued to be much rarer in houses than before spraying, even 2 years after the last spraying. [Perhaps enough traces of DDT remained to be irritant to the mosquitoes?]

In the Central Amazon region the numbers and exophilic habits of this mosquito make malaria suppression by house-spraying difficult. There are, too, other problems such as dwellings (shelters) without walls, nomadic people, low population over a vast area and poor communications. It appears that the best method of malaria eradication in this zone may be by drugs (*e.g.*, by the Pinotti method, in salt).

A. cruzii cruzii and *A. bellator*, which are responsible for malaria transmission on the southern coast of Brazil, are to some extent endophilic. They enter houses at night and often fly outside after feeding. They sometimes rest on the outside walls of houses. Infected specimens have been taken in traps baited by man or animals outside, as well as inside houses.

DDT spraying 3 or 4 times a year has been used against these species, with some success; but in places there has been some refractory transmission. It may be that some action against the bromeliads may usefully be combined with insecticides.

Tests by the Busvine-Nash method have shown that all species continue to be normally susceptible to DDT. *J. R. Busvine*

ZUCKERMAN, A. **Blood Loss and Replacement in Plasmodial Infections. III.** *Plasmodium cynomolgi, Plasmodium gonderi* **and** *Plasmodium knowlesi* **in** *Macaca mulatta mulatta*, **the Rhesus Monkey.** *J. Infect. Dis.* 1960, Mar.–Apr., v. 106, No. 2, 123–40, 6 figs. [15 refs.]

This series of investigations deals with an attempt to elucidate factors affecting the course of infection and immune phenomena in rats during and after infection. Experiments with *Plasmodium berghei* and *P. vinckei* were described earlier [this *Bulletin*, 1957, v. 54, 1391; 1959, v. 56, 696]. Similar factors have now been studied in the simian malarias named in the title. Details of techniques will be found in the earlier papers.

Data on *P. cynomolgi* from 15 rhesus monkeys provided the following information. Parasitaemia reached 10–15% and there were some deaths. A mild reticulocyte response after peak infections was observed, and the anaemia present was most severe about 1 week after the parasite crisis. Factors other than direct rupture of red cells by parasites caused the blood count to fall to one-third of its normal value. Invasion of red cells by merozoites was of random character, unlike that in rats in which reticulocytes were favoured. Infections in monkeys bled before infection and made anaemic were not exacerbated as strongly as in rats. Data on *P. gonderi* were collected from 5 monkeys. This infection was of mild character, and continued for months with moderate reticulocytosis. Blood loss appeared to be greater than accounted for by parasitaemia present and amounted to about one-third of the total red cells. In the case of *P. knowlesi* data were collected from 3 monkeys. Infections were severe and fatal if untreated. Immunity to reinfection was rapidly developed. Sometimes death occurred before development of reticulocytosis but if life was saved by drug treatment reticulocytosis followed reinoculation. Blood loss through direct destruction of red cells by parasites masked other causes and mature cells were generally preferred by merozoites.

The fact that blood loss in the 5 mammalian malarias studied to date exceeded that due to parasitic rupture suggested to the author "the production of auto-antibody against the host's own erythrocytes, altered by the presence of plasmodia". *J. D. Fulton*

LAPIERRE, J., SRETENOVIC, M. & ROUSSET, J. J. Influence de la splénectomie sur la réticulocytose au cours de l'infection à *Plasmodium berghei* (Vincke et Lips 1949) chez la souris blanche. [**Effect of Splenectomy on Reticulocytosis during** *Plasmodium berghei* **Infection in White Mice**] *Bull. Soc. Path. Exot.* 1958, Nov.–Dec., v. 51, No. 6, 897–901.

6 white mice were splenectomized and 2 days later received 1,500 *Plasmodium berghei* each. 3 control mice were similarly infected. The parasitaemia developed more slowly in the former group and was always at a lower level; death occurred on the 15th or 16th day in the splenectomized mice and between the 9th and 15th days in the controls. There was no apparent connexion between

the number of reticulocytes and the density of parasitaemia, although reticulocytosis was less in the splenectomized animals during the first week of infection. In a second experiment, 5 mice were inoculated with 1,200 parasites each and were splenectomized 7 days later; the course of parasitaemia was uninterrupted and reticulocytosis was unaffected. These results confirmed earlier ones on 9 mice with a single exception. [This unusual reaction of a malaria parasite to splenectomy has also been observed by SINGER (this *Bulletin*, 1954, v. 51, 1040) and FABIANI and ORFILA (*ibid.*, 1955, v. 52, 873).] *P. C. C. Garnham*

SHERMAN, I. W. & HULL, R. W. **Serum Alterations in Avian Malaria.** *J. Protozoology*. 1960, May, v. 7, No. 2, 171–6, 2 figs. [21 refs.]

The present investigation was carried out to determine by means of paper electrophoresis the changes which occur in the serum proteins of the avian host during infection with *Plasmodium lophurae*. Before infection of chicks a 1 ml. blood sample was withdrawn from each host. A similar blood sample was taken from each chick daily after infection. Serum was subjected to electrophoresis on paper for 8 hours at 6°C. at a constant voltage of 95 volts and the paper was then dried and stained in bromphenol blue for proteins or in Oil Red for lipoproteins. The intensity of staining was then determined and the amount of each fraction present evaluated statistically. A table records the mean percentage of total protein and mobility indices of the serum fractions separated during the course of the malarial infection in chickens.

There was a quantitative change in gamma globulin but not of alpha globulin or of alpha lipoprotein. The beta globulin remained constant in the individual hosts and showed a significant increase on the 4th day. These alterations in serum components during the crisis are shown in a figure. Gamma globulin alone showed alteration in relative mobility. The fast moving lipoprotein of pigeon serum described during infection with *P. relictum* [this *Bulletin*, 1957, v. 54, 1059] was not detected in the present experiments. It appeared that an adequate level of alpha lipoprotein was present during recovery. The lowering of albumin content during infection was confirmed. *J. D. Fulton*

TRYPANOSOMIASIS

In this section abstracts are arranged as far as possible in the following order:—African—*human, animal;* American—*Chagas's disease and other trypanosome infections. In each form the following order is followed:*—*epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control.*

BURSELL, E. **The Measurement of Size in Tsetse Flies** (*Glossina*). *Bull. Entom. Res.* 1960, Apr., v. 51, Pt. 1, 33–7, 2 figs.

Details are given of a measure which is a function of the dorsal thoracic surface, and its use is discussed.

FROMENTIN, Huguette. Crises trypanolytiques et variations antigéniques de *Trypanosoma gambiense* chez la souris. [**Trypanolytic Crises and Antigenic Variations of *Trypanosoma gambiense* in Mice**] *Bull. Soc. Path. Exot.* 1959, July–Aug., v. 52, No. 4, 423–6.

As is known, in chronic experimental infections with trypanosomes trypanolytic crises are succeeded by relapses. According to some authors, the relapse strain may contain several antigenic types, while others believe that it is represented by a single type, differing antigenically from the original one.

To solve this question the present author carried out a series of experiments with *Trypanosoma gambiense*. An infected mouse was treated with a subcurative dose of tryparsamide, causing the disappearance of parasites, with a relapse a week later; the agglutination reaction carried out on trypanosomes recovered from the blood, liver, spleen and brain, tested against anti-blood serum, showed that all the trypanosomes were of the same antigenic type, distinct from the original one. This relapse strain was inoculated into another mouse, which was also treated with the drug; after disappearance of the parasites it also relapsed, and agglutination reactions in subinoculated mice tested with anti-blood serum of this relapse strain against trypanosomes from the blood, spleen and brain revealed a third antigenic type, differing from the first two. However, trypanosomes from the liver were not agglutinated by this antiserum but reacted to antiserum of the second type, *i.e.*, they were similar to the antigenic type of the donor parasites. In a third experiment, a mouse harbouring trypanosomes of the first antigenic type was used, in which parasitaemia was reduced by a single dose of tryparsamide. Agglutination reactions showed that all the trypanosomes belonged to a fourth antigenic type, but in a control experiment it was like the first antigenic type, indicating that in the absence of a relapse the type had not changed.

It was thus shown that when infected mice are treated with a subcurative dose of tryparsamide, there is always a change of the antigenic type in the relapse trypanosomes present in the blood. However, this change does not affect all the trypanosomes that remain in the inner organs, with the result that trypanosomes of different antigenic types can be isolated from them.

[See also this *Bulletin*, 1958, v. 55, 486.] *C. A. Hoare*

STEPHEN, L. E. **The Prophylactic and Therapeutic Activity of Metamidium and its Suramin Salt against Trypanosomiasis in Cattle.** Reprinted from *Vet. Record.* 1960, Jan. 30, v. 72, No. 5, 80–84.

HOREN, W. P. **Modified Technique for Long-Term Cultivation of *Trypanosoma cruzi* and *Leishmania donovani*.** [Research Notes.] *J. Parasitology.* 1960, Apr., v. 46, No. 2, 256.

Maintenance of *Trypanosoma cruzi* and *Leishmania donovani* in culture usually requires frequent transfer, commonly at 2-week intervals. The author, from the University of California School of Medicine, refers to the methods recorded in the literature which were used to solve this requirement and these included the use of semi-solid media and rubber-capped test tubes.

The present author used a semi-solid blood agar based on that described by WENYON [this *Bulletin*, 1926, v. 23, 854]. 2 gm. of Bacto-agar and 8·5 gm. NaCl are dissolved in 1000 cc. boiling distilled water and 100 cc. aliquots poured into 8-oz. bottles, which are sterilized at 15 lb. pressure and 118°C. for 15 minutes and cooled. Then 10-20 cc. sterile rabbit blood are added to the warm (45°–50°) 100 cc. solution, and mixed well. 10 cc. of this suspension are placed at once in sterile screw-capped tubes and checked for sterility. Sterile tubes are inoculated with the parasites and the cultures stored at room temperature (25°C.).

Some 75% of pure cultures of either species of haemoflagellate survived, apparently unchanged, for 9 to 11 months. One culture of *L. donovani* survived for 30 months without addition of fresh medium: this was verified by adding 5 cc. of fresh medium to the old, nearly solid medium.

This method is simple, materials are readily obtainable, defibrinated blood is not required, the screw-capped tubes reduce evaporation, but admit sufficient oxygen without greatly increasing chances of contamination, and no special storage conditions are needed. Although transfer should be made every 2 to 3 months if possible, there is little danger of losing stock cultures if this is not practicable. *H. J. O'D. Burke-Gaffney*

See also p. 954, ZELEDON, **Comparative Physiological Studies on Four Species of Hemoflagellates in Culture. I. Endogenous Respiration and Respiration in the Presence of Glucose.**

TORANZOS, L. B. Estudio de los cristales de oxihemoglobina del trayecto intestinal del *Triatoma infestans* en diferentes especies de Animales. [**Study of the Crystals of Oxyhaemoglobin in the Intestinal Tract of *Triatoma infestans* fed on Different Species of Animals**] *Rev. Facul. Med. de Tucumán*. 1958, Dec., v. 1, Nos. 3/4, 397–403, 6 figs. [16 refs.] English summary.

Some account is given, illustrated by 6 photomicrographs, of differences observed by ordinary and by polarized light in oxyhaemoglobin crystals formed in blood meals of *Triatoma infestans* fed on man, dog, cat, guineapig and pigeon. Combination of the several kinds of observations seems helpful in differentiating hosts. *D. S. Bertram*

DE SIQUEIRA, A. F. Estudos sôbre a reação da precipitina aplicada à identificaçao de sangue ingerido por triatomíneos. [**Studies on the Precipitin Test applied to the Identification of Blood Meals of Triatomine Bugs**] *Rev. Inst. Med. Trop. São Paulo*. 1960, Jan.–Feb., v. 2, No. 1, 41–53. [21 refs.] English summary.

Recent refinements in the technique of the precipitin test, as advocated by WEITZ [this *Bulletin*, 1953, v. 50, 82] were adopted in this study. They are described and discussed fully in relation to the author's particular investigation on the value of this test in determining the nature of the blood in triatomine

bugs. Antisera prepared in rabbits and antigens were prepared from the following: man, pig, ox, goat, dog, horse, armadillo, opossum, rat, bat, lizard, fowl, pigeon, sparrow. Absorption of antisera greatly improved specificity but not completely in certain instances and each antiserum was notably less sensitive to its homologous antigen after this treatment. For actual tests on bug blood-meals, laboratory-reared *Triatoma infestans* appear to have been fed either only on fowl, or on fowl first and 18 days later on a dog, and not [as the English summary might suggest] on one or pairs of the complete range of hosts for which antisera were (as above) prepared. Positive results were obtained up to 120 days after a fowl meal, and fowl and dog were separately identifiable 75 days after the initial fowl meal. *D. S. Bertram*

SILVA, Isabel I. Sobre la conveniencia de realizar el xenodiagnóstico fuera del organismo humano en todos los casos. [**The Convenience of Carrying Out Xenodiagnosis away from the Patient**] *Rev. Facul. Med. de Tucumán*. 1958, Dec., v. 1, Nos. 3/4, 405–15, 2 figs. [17 refs.] English summary (9 lines).

6 to 10 3rd to 4th stage larvae of laboratory-reared *Triatoma infestans* are confined in a glass tube 8 to 9 cm. long and 2·5 cm. in diameter, the open upper end closed with gauze and folded filter paper strips being included in the tube. Defibrinated blood (2 to 2·5 cc.) of a person from whom a xenodiagnostic feed is desired is put in a small container, closed with a membrane of fowl skin, and the membrane surface applied to the gauze end of the tube of bugs. Several such tubes (20 are figured) may be slung in holes in a platform on top of which a metal plate, heated at 37° to 40°C., then rests. It is said that this is a very successful method for xenodiagnostic feeds, sparing the patient inconvenience and discomfort. Numerical data are, however, to be given later. Responses of the bugs to different stimuli are somewhat summarily reported in connexion with providing suitable conditions for them in the feeding tubes.

D. S. Bertram

DE REZENDE, J. M. & RASSI, A. Comprometimento do esôfago na moléstia de Chagas. Megaesôfago e cardiopatia. [**Oesophagus Involvement in Chagas's Disease**] Reprinted from *Hospital*. Rio de Janeiro. 1958, Jan., v. 53, No. 1, 1–16, 2 figs. [41 refs.] English summary.

The authors state that recently morbid anatomy examinations have proved conclusively the existence of concomitant megaoesophagus and heart disease in Chagas's disease. It is suggested that the disintegrating *Leishmania* liberate a toxin which destroys the intramural plexuses, so acting as a denervator particularly of the oesophagus but also of the whole digestive tube, hence megastomach, megacolon, etc. Thus from the pathogenic point of view Chagas's disease should be interpreted as a disease of the autonomic nervous system, the clinical conditions found resulting from this and not from destruction of the parasitized muscle cells.

In Brazil the "megas" have a high incidence in 3 states. The authors examined 2 groups of patients, the Machado-Guerreiro (M-G) test being performed on all: (a) 277 with suspected Chagas's disease; (b) 170 diagnosed radiologically as having megaoesophagus. 190 patients were positive in (a) and 152 in (b) and these were then studied. In group (a) 44 of 53 patients who complained of dysphagia showed X-ray evidence of involvement of the oesophagus though no advanced mega condition was found. In group (b) 50% of 126 patients examined showed clinical, X-ray, and ECG evidence of heart disease. A definite sex incidence of 2:1 males: females was found and also a notable relation of oesophageal involvement to age and the presumed beginning of the disease.

The authors state that megaoesophagus is an early and sure indicator of the disease and that the patients with megas will develop heart disease if they live long enough. No explanation of the sex incidence can be given but there are also regional differences. They conclude by emphasizing (a) that if affected, the oesophagus is affected earlier than the heart; (b) any suggestion of dysphagia necessitates an M-G test; (c) the clinical classification of the disease should be revised to give the digestive form individual status. *W. K. Dunscombe*

LEISHMANIASIS

In this section abstracts are arranged as far as possible in the following order:—visceral, cutaneous, muco-cutaneous.

See also p. 855, PETRISHCHEVA, **Field Methods of investigating Sandflies and Anti-Sandfly Measures.**

DE ALENCAR, J. E. Aspectos clínicos do calazar americano. [**Clinical Picture of American Kala Azar**] *Rev. Brasileira Malariologia.* Rio de Janeiro. 1959, Jan., v. 11, No. 1, 19–44, 3 maps, 9 graphs & 4 figs. [Numerous refs.] English summary.

The author mentions that in north-east Brazil between 1913 and 1957 1,872 cases of leishmaniasis have been diagnosed in 10 States, being particularly numerous in the State of Ceará. Out of over 1.000 cases seen there between 1953 and 1957 81·2% occurred in children 0-9 years of age, of which 8·54% were found in those under 1 year and 23·17% in those of 2 years, thus in this respect resembling Mediterranean fever. The incubation period was difficult to determine as the incidence is mainly in rural areas but appeared generally to be from 2-5 months.

The main initial symptoms were diarrhoea and cough, depending on whether the disease took the respiratory or enteric form. Then came irregular intermittent/remittent fever, enlargement of the spleen and liver, polyadenitis and fairly severe anaemia with loss of weight. The splenic enlargement occurred very rapidly in some cases but was not painful unless there was perisplenitis or an infarction. In addition to the almost constant anaemia (out of 123 patients only 4·9% had a count of over 4 million per cmm.) there was a reduction in white cells, especially the polymorphs, and the platelets. The characteristic

pigmentation of the skin was not seen but pallor was marked. A dry irritating cough was frequently noted and also tachypnoea due to alteration of the lung parenchyma as a consequence of the raised diaphragm caused by hepatic enlargement. Ascites and oedema were seen often and also icterus in the florid state. On serum electrophoresis there was inversion of the A/G ratio, the gamma globulin being particularly raised.

47 patients died out of the 1,000 or so seen in Ceará State between 1953 and 1957.

The author considers that Brazilian leishmaniasis occupies an intermediate position between the Mediterranean and Indian types.

[An interesting map shows the intimate relationship between human and canine leishmaniasis in Ceará State.] *W. K. Dunscombe*

VINGIANI, A. Sugli aspetti epiteliomatosi della Leishmaniosi cutanea. [**On the Epitheliomatous Aspects of Cutaneous Leishmaniasis**] *Acta Med. Italica.* 1959, Apr., v. 14, No. 4, 101–5, 8 figs. [10 refs.]

The author has studied the histology of Oriental sore in patients of the Naples Hospital for Infectious and Tropical Diseases. He found changes in the epithelial layers which ranged from simple thickening with acanthosis and hyperkeratosis to a proliferation of epitheliomatous type. The changes often involved the hair follicles. These changes follow a gradual course from inflammatory infiltration to tuberculoid granulomatosis. In due course, the tuberculoid infiltration extends into the deeper layers of the skin. When it takes place, healing is by the sloughing-off of the lesion and its replacement by scar tissue.

Photomicrographs of the tissue sections are reproduced to illustrate the findings. *J. Cauchi*

FEVERS OF THE TYPHUS GROUP

In this section abstracts are arranged as far as possible in the following order:—general; louse-borne typhus, flea-borne typhus, mite-borne typhus; rickettsialpox; tick-borne typhus; Q fever, other rickettsial diseases.

JUILLAN, M. Protéines sériques et vitesse de sédimentation globulaire chez la souris au cours de la pneumonie rickettsienne expérimentale. [**Serum Proteins and Erythrocyte Sedimentation Rate in Mice with Experimental Rickettsial Pneumonia**] *Arch. Inst. Pasteur d'Algérie.* 1960, Mar., v. 38, No. 1, 23–6. [11 refs.]

The following is a translation of the author's summary:—

During the acute phase of experimental *Rickettsia prowazeki* pneumonia in mice an increase in alpha globulins and an increase in the erythrocyte sedimentation rate were observed. The erythrocyte sedimentation later slowly reverted to normal while the gamma globulins increased, but were maintained at a moderate level.

[See also this *Bulletin,* 1951, v. 48, 353.] *H. J. O'D. Burke-Gaffney*

POSPIŠIL, R., POLONY, R. & KRATOCHVÍL, I. Pátranie po murínnej škvrnivke u potkanov (*Rattus norvegicus*) v Košiciach. [**Investigation of Murine Typhus in Rats** (*Rattus norvegicus*) **in Kosice**] Reprinted from *Sborník Prác Lekárskej Fakul. Univ. Komenského v. Košiciach.* 1959, v. 2, Nos. 3/4, 67–70. [17 refs.]

The English summary appended to the paper is as follows:—

"The authors investigated murine typhus fever by the complement-fixation test and attempts to isolate *Rickettsia mooseri* in 174 rats caught in the territory of the city of Košice. Serological examination as well as isolation experiments yielded negative results in all cases."

GOKSU, K., WHARTON, G. W. & YUNKER, C. E. **Variation in Populations of Laboratory-Reared** *Trombicula* (*Leptotrombidium*) *akamushi* **(Acarina: Trombiculidae).** *Acarologia.* Abbeville. 1960, Apr., v. 2, No. 2, 199–209, 14 figs. [10 refs.]

FISH, N. A. & LABZOFFSKY, N. A. **The Incidence of Q Fever among Dairy Herds in Western Ontario.** *Canadian J. Pub. Health.* 1960, May, v. 51, No. 5, 200–205. [16 refs.]

Pooled milk samples from 14 out of 200 dairy herds in Western Ontario gave a positive reaction for Q fever in the capillary tube agglutination test. Of 334 lactating animals in the 14 positive herds, 60 (17·9%) had antibodies for *Rickettsia burneti* in their milk; sera from 59 of the 60 animals reacted positively in the capillary agglutination test and 54 of these sera contained complement-fixing antibodies for *R. burneti* antigen at titres of 1 in 8 or higher.

The source of infection of the positive herds remains undetermined. Sheep or goats do not appear to have been raised in proximity to them. Several thousand human sera examined during the past 10 years, including about 150 sera from abattoir workers, have with one exception failed to show Q fever antibodies; the exception was from a person recently arrived from Italy. The negative human findings, in conjunction with the indications that Q fever is not uncommon among cattle in Ontario, are difficult to interpret. Possible explanations include the occurrence among cattle of a variant of *R. burneti* with low pathogenicity for man, or infection of cattle with an organism which is antigenically related to *R. burneti.*

The authors remark that a parallel situation may exist with regard to ornithosis in pigeons; about 35% of pigeons in southern Ontario are infected with ornithosis virus, "quite a number" of pigeon fanciers are to be found in Ontario, yet only 1 case of human psittacosis that could be directly traced to pigeons has been detected during a period of more than 15 years.

[See also this *Bulletin,* 1959, v. 56, 524.] *R. S. F. Hennessey*

YELLOW FEVER

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control.

BOORMAN, J. P. T. **Observations on the Feeding Habits of the Mosquito, *Aëdes* (*Stegomyia*) *aegypti* (Linnaeus): the Loss of Fluid after a Blood-Meal and the Amount of Blood taken during Feeding.** *Ann. Trop. Med. & Parasit.* 1960, Apr., v. 54, No. 1, 8–14. [13 refs.]

In the author's experience, *Aëdes aegypti* feeding on blood-virus mixtures through a membrane commonly defaecate drops of fluid up to 15 minutes after the meal. The nature of the fluid and its significance in virus study are examined. From several experiments, including use of radioactive cerium and sulphur in feed mixtures or injected into host mice, it is concluded that whole blood is not a usual content of the drops, but the fluid (about 1·5 cmm. is defaecated) contains uric acid from the Malpighian tubes, amino-acids and possibly protein. It was probably absorbed through the mid-gut wall and subsequently excreted by the Malpighian tubes and hind-gut. Virus (Semliki Forest) was detected only if the drops contained whole blood. On the basis of radio-isotope counts in the drops it is concluded that *A. aegypti* was ingesting 4·0–4·5 cmm. of blood, about 68% more than estimates by other authors based on weighings [this *Bulletin*, 1947, v. 44, 566; 1948, v. 45, 121; 1956, v. 53, 1403]. Mechanical transmission from virus in infected drops gaining entry to the skin of a second host immediately after an initial incomplete meal on a first host is deemed improbable, although theoretically possible. *D. S. Bertram*

PANTHIER, R., HUSSON, R. A. & HANNOUN, C. Les allergiques et la vaccination anti-amarile 17 D. Résultats complémentaires. [**Allergic Subjects and 17D Yellow Fever Vaccination. Complementary Results**] *Bull. Soc. Path. Exot.* 1959, Nov.–Dec., v. 52, No. 6, 759–64, 1 fig.

In a previous article Panthier and Husson [this *Bulletin*, 1957, v. 54, 1173] reported on the results of an enquiry into the allergic reactions evoked by 17D vaccine and on the decrease effected in the number and intensity of these reactions by a preliminary intradermal injection of 0·1 ml. of the vaccine, given 20 minutes before the ordinary 0·5 ml. subcutaneous dose. The number of persons investigated in that enquiry, however, was insufficient to permit statistically significant evaluation of the percentage of allergic persons in the various age-groups presenting themselves for vaccination. In this connexion it is now shown that of 34,656 vaccinated persons (20,837 males and 13,819 females) 2,875 (1,500 males and 1,375 females) were, on their own admission, habitually afflicted with some form of allergic disorder and that the percentage of allergic persons among those vaccinated in each age-group, in years 1–10, 10–20, 20–30, 30–40, 40–50 and 50 and over, was, respectively, 7·0, 5·26, 5·3, 7·16, 10·13 and 11·9 for males and 8·27, 7·23, 9·3, 10·64, 13·56 and 14·42 for females.

To the 2,875 admittedly allergic persons the preliminary injection was given. The local cutaneous reactions, which usually followed within 20 minutes of the

injection, varied widely with the different types of allergy, and details of these reactions in persons with a history of eczema, urticaria, hay fever and asthma are given in the text.

Generally speaking, the results observed during the present investigation confirmed those previously published [*loc. cit.*]. When an intradermal test injection was given to a non-allergic person, the result was always negative. Whenever a previously vaccinated person had shown at the time of that vaccination a secondary allergic reaction, the reaction to the intradermal dose, given as a preliminary to a second vaccination, was invariably positive, and no general reaction followed the second vaccination. The administration of 17D vaccine, first by the intradermal, then by the subcutaneous route, conferred a high degree of immunity on persons so treated; even when vaccination had to be discontinued after injection of the intradermal test dose, the immunity evoked by that test dose was found to be by no means inconsiderable. *G. Stuart*

DENGUE AND ALLIED FEVERS

ROWAN, L. C. **An Outbreak of Dengue-Like Fever, North Queensland, 1954: Serological Findings with the Virus Neutralization and Complement Fixation Tests.** *Med. J. Australia.* 1959, Mar. 7, v. 1, No. 10, 323–8. [21 refs.]

An epidemic of dengue occurred in Townsville, northern Queensland, in February–May 1954 [this *Bulletin*, 1956, v. 53, 1232]. Sera from patients, after inactivation, were tested in intracerebral virus-dilution neutralization tests in mice. All of the 12 sera collected 17 days to 18 months after onset of the illness had neutralizing indices of 708–70,790 against dengue-1 virus and generally lower indices against dengue-2: only 1 had neutralizing antibody against Murray Valley encephalitis virus and 3 had indices over 100 against West Nile virus: none had antibody detected against Japanese encephalitis virus.

Complement-fixation tests were made with acetone-ether extracted mouse brain antigens. Significant increases in complement-fixing antibody against dengue-1 were demonstrated in 5 paired sera and falls in titre were demonstrated in some other late pairs. 14 sera were tested against both dengue-1 and Murray Valley antigens: 2 showed significantly higher titres against dengue-1 and 3 against Murray Valley—the remainder had similar amounts of antibody against both. Similar results were obtained when dengue-2 and West Nile antigens were added. 5 pairs of sera were tested against dengue-1, Murray Valley and West Nile antigens. None showed antibody against dengue-1 but all showed significant antibody increases against Murray Valley and West Nile viruses—higher against the former. None had antibody in the acute-phase specimens. The dengue antigen used in these tests was however of low potency.

The results suggest that the epidemic may have been caused by dengue-1 virus. *C. E. Gordon Smith*

RABIES

HUMPHREY, G. L., KEMP, G. E. & WOOD, E. G. **A Fatal Case of Rabies in a Woman bitten by an Insectivorous Bat.** *Pub. Health Rep.* Wash. 1960, Apr., v. 75, No. 4, 317–26, 1 fig. [32 refs.]

Although epidemiological evidence has slowly accumulated incriminating insectivorous bats as a source of rabies infection for man and while transmission from a naturally infected insectivorous bat (*Myotis californicus*) to laboratory mice has been demonstrated by BELL [this *Bulletin*, 1959, v. 56, 1023], there has been no unequivocal evidence that rabid insectivorous bats have infected man or other animals in nature, with the exception of the case now recorded.

This case occurred in a 53-year-old woman, bitten on the middle finger of the left hand by a partially paralysed silver-haired bat, *Lasionycteris noctivagans*, which on 30 August 1958 she had found lying on the ground near her home in Butte County, California. Histological examination of the bat's brain having revealed the presence of Negri bodies, the woman was given 3,000 units of hyperimmune antirabies serum on the third day after she was bitten, and on the following day she received the first of the prescribed 14 doses of antirabies vaccine of duck-embryo origin. Although treatment was complicated by a skin rash, the woman continued well until 24 October, when she complained of numbness in the left arm and fingers and pain in the region of the 3rd thoracic vertebra. Thereafter her condition gradually deteriorated, becoming complicated by an ascending paralysis. On 4 November the woman died, 66 days following exposure, 49 days after completion of treatment and 11 days after onset of symptoms. At the autopsy performed 13 hours after death the brain was removed for laboratory investigation.

Microscopic examination of tissue impressions and sections of this brain material showed the presence of intracytoplasmic inclusion bodies not characteristic of Negri bodies; the histopathological picture was a diffuse non-suppurative encephalomyelitis, with the midbrain and brain stem especially affected. Suspensions of the human brain material and of the bat's brain alike proved infective for mice, and mouse brains all contained Negri bodies. The agent recovered from the human brain was further confirmed as rabies virus by specific serum-virus neutralization tests. Isolation and identification of rabies virus from vector and victim had thus been achieved. In connexion with the case now reported as the first completely documented case of human rabies caused by the bite of an insectivorous bat, it is of importance to observe that the bitten person was without history of previous exposure to rabies infection.

Finally, in discussing the whole question of rabies in non-sanguinivorous bats, the authors review all available data on the extent of the insectivorous bat rabies reservoir in the United States and give details of 5 other cases of human rabies associated with insectivorous bats; in none of these cases, however, was the bat identified or examined for rabies.

Details of rabid bats found in California between 1954 and 1959 are shown in a table. *G. Stuart*

AVERY, R. J. & TAILYOUR, J. M. **The Isolation of the Rabies Virus from Insectivorous Bats in British Columbia.** *Canadian J. Comp. Med.* 1960, May, v. 24, No. 5, 143–6.

An account of the first confirmed cases of bat rabies reported in Canada is given in this paper, which describes the isolation of rabies virus from 4 insectivorous bats taken in British Columbia between June 1957 and August 1958. All 4 bats belonged to colonial species and all, at the time of capture, had shown peculiarities of behaviour. The first isolation was from an *Eptesicus fuscus* bat, which on 3 June 1957 had been picked up in the Greater Vancouver area and sent for laboratory examination 2 days after its death. As the brain was found to be in a state of liquefaction, no impression smears were made, but 6 mice were inoculated intracerebrally with 0·03 ml. of a 10% suspension of the brain material. 5 of the mice died, without typical signs of rabies, 11-12 days after inoculation. Second and third passages were made in 12 mice each and deaths occurred 10-14 days after inoculation. Impression smears were made from the brains of 2 mice from each of the first 2 passages; these were negative for Negri bodies in the first passage, positive in the second passage. Serum-virus neutralization tests confirmed the identity of the infective agent. Results following the inoculation of hamsters, guineapigs, rabbits and a dog clearly demonstrate the virulence of the virus for other animal species.

After this initial positive finding a survey of captured, killed and dead bats was made in the 3-month period July–September 1957. In an investigation of some 200 bats, pools were made up of not more than 6 lots of brain tissue taken from the same species of bats captured in a more or less limited area. One of these pools, made up of the small brown bat, *Myotis lucifugus*, was proved to contain the virus of rabies; within this pool there was only 1 bat which had shown abnormal behaviour.

In 1958 two other bats were found to be positive for rabies: an immature male *Eptesicus fuscus* submitted from the Okanagan region and a mature female *Lasionycteris noctivagans* submitted from Osoyoos. In these bats Negri bodies were demonstrable in the brains of both first- and second-passage mice, but not in impressions made from the original bat brains. From salivary gland material of both bats rabies virus was isolated.

Finally, the occurrence of specific antibody was sought in bats captured in the area of the Okanagan region, where an *Eptesicus fuscus* infected with rabies had been found. Results failed to reveal the presence of neutralizing antibodies in any of the sera tested. *G. Stuart*

NIKOLITSCH, M. Das Virus der Fledermäuse und die Encephalomyelitis des Menschen. [**The Virus of Bats and Encephalomyelitis of Man**] *Arch. f. Hyg. u. Bakt.* 1959, Dec., v. 143, No. 8, 607–18. [21 refs.]

An investigation has been made of the relationship between rabies virus, strains of virus isolated from the brain of a bat in Yugoslavia (SM) and Turkey (SMT), and the SV strain of the alleged Russian multiple sclerosis virus. In neutralization tests with rabies antiserum all the viruses were neutralized to equal extent. The SM and SV strains produced fatal encephalitis in rabbits

after an incubation period of 3½–4 days; with the SMT strain the incubation period was longer (7–8 days). It was concluded that the SM and SV strains were identical, and that these and similar viruses isolated in various countries are mutants of rabies virus. *D. J. Bauer*

JELESIĆ, Z. & JELESIĆ, Renata. Histopathologische Eigenschaften des Tollwutvirus der Fledermäuse in Jugoslawien. [**Histopathological Properties of Yugoslavian Bat Rabies Virus**] *Arch. f. Hyg. u. Bakt.* 1959, Dec., v. 143, No. 8, 619–23, 2 figs.

The authors have studied the histopathology of the encephalitis produced in rabbits by the intracerebral injection of SM virus, isolated from the brain of the bat *Nyctalus noctula* Schreb in Yugoslavia and described in the preceding paper. The meninges were thickened and infiltrated with lymphoid cells and histiocytes; the brain showed diffuse oedema, particularly in the hippocampus and ependyma, with hyperaemia, capilliary haemorrhages, perivascular cuffing, nodular proliferation of the glia and degeneration of neurones. The cells of the pyramidal layer of the hippocampus contained cytoplasmic basophil inclusions 3–4μ in diameter. After 30 intracerebral passages in rabbits the signs of meningitis were less marked and the inclusions were found less frequently. After 62 passages the inclusions became eosinophilic, resembling Negri bodies. *D. J. Bauer*

KAPLAN, M. M., FORSEK, Z. & KOPROWSKI, H. **Demonstration of Rabies Virus in Tissue Culture with Fluorescent Antibody Technique.** *Bull. World Health Organization.* Geneva. 1960, v. 22, Nos. 3/4, 434–5, 1 fig.

The application of tissue culture techniques in the study of rabies virus has so far met with limited success. In the present article the authors report progress in the cultivation of rabies fixed virus in the explants of suckling hamster kidney and demonstrate that the virus so cultured can be stained with fluorescent antibody conjugate.

In their experiments the authors prepared primary explants by mincing, followed by trypsinization and seeding into bottles of 100 ml. capacity, suspensions of washed and centrifuged cells. The medium employed for growth was Eagle-Earle's solution with 10% calf serum, in which satisfactory sheets of cells developed in 5–7 days. The fixed virus strain used for inoculation was the CVS 24, with a titre of $10^{-6.4}$ in mice; of this strain a 10% mouse brain suspension was centrifuged for 15 minutes in the cold and of the supernatant 1 ml. was inoculated onto the cell sheet and allowed to remain for 1 hour. 15 ml. of Eagle-Earle's solution with 5% calf serum were then added—this being the medium used thereafter for maintenance. The medium, on its becoming acid, was changed every 5–8 days and 8 changes of medium were made during a 2-month period. After 6 weeks' maintenance of the cells in culture, the cells from one bottle were removed with trypsin and seeded into other bottles—this derived line of cells being maintained in the same way as the original line, with appropriate changes of medium.

The 8th supernatant of the original cell line, representing 60 days of continuous cultivation, and the 2nd supernatant of the derived line of cells were titrated for the presence of rabies virus by intracerebral inoculation into 3–4-week-old mice and a titre of 10^{-4} was obtained in the supernatant of the derived line. Neutralization tests confirmed the specificity of the virus. Staining of a suspension of cells from the derived cell line with fluorescent antibody conjugate revealed particles of specifically stained rabies virus in the cytoplasm of the kidney cells, as well as agglomerations of these particles at the periphery of the nucleus in many cells. At the stage of cultivation reached, however, too few cells seemed to be affected for grossly cytopathic effects to be discernible.

[The development of a tissue culture system sensitive to demonstration of the cytopathic effects of rabies virus and capable of promoting virus growth to high titre would greatly facilitate the qualitative and quantitative study of the rabies virus. Moreover growth of rabies virus in non-tumour tissue for use in preparing a non-nervous tissue vaccine for the post-exposure treatment of man is obviously a desideratum.]

In an addendum to the above article the authors report their success in growing, and staining with fluorescent antibody, the CVS 24 strain in tissue culture of a continuous diploid cell line derived from normal foetal lung. *G. Stuart*

SÉRIÉ, C. & ANDRAL, L., with the technical collaboration of A. GENTILE. Études expérimentales sur la rage en Éthiopie. II. Pouvoir virulicide du sérum des chiens errants. [**Experimental Studies on Rabies in Ethiopia. II. Viricidal Activity of Stray Dogs' Serum**] *Ann. Inst. Pasteur.* 1960, May, v. 98, No. 5, 688–93.

This article records the results of a study on the occurrence of rabies neutralizing antibody in the sera of 100 stray dogs collected in Ethiopia, a country in which rabies is endemic. Only such dogs as had undergone 8–15 days' observation without showing signs of rabies or other acute illness were used in the study. On sera taken from these animals neutralization tests in mice were carried out in 2 stages: first, a qualitative screening test, to detect the presence of antibody (in this test 1 part of virus was added to 19 parts of serum, giving a virtually undiluted serum containing 30 LD50 of virus); and secondly, quantitative tests on the neutralizing sera thus detected, to determine their antibody titre and their neutralization index. In all these tests the reference standard challenge virus (CVS) strain of rabies virus was employed.

Results of qualitative screening showed that of the 100 sera tested, 24 protected 8–10 mice out of 10 and were, therefore, considered as neutralizing. Of 20 sera considered, qualitatively, as neutralizing, 6 showed a neutralizing titre of more than 1 in 125, while 14 had titres ranging from 1 in 6 to 1 in 80. Of the 24 sera considered as neutralizing, 4 had a neutralization index exceeding 1,000, while, in all, 14 had an index greater than or equal to 10, thereby confirming the presence in these sera of specific viricidal antibody. Of the 4 sera with a neutralization index exceeding 1,000, the 3 tested had a neutralization titre of more than 1 in 125; apart from these 3 sera, there was no parallelism between the neutralization index and the neutralization titre of the sera studied.

[For part I, see this *Bulletin*, 1958, v. 55, 30.] *G. Stuart*

ANDERSON, G. R., SCHNURRENBERGER, P. R., MASTERSON, R. A. & WENTWORTH, F. H. **Avian Embryo Rabies Immunization. I. Duck-Embryo Vaccine administered intradermally in Man.** *Amer. J. Hyg.* 1960, Mar., v. 71, No. 2, 158–67, 4 figs. [32 refs.]

7-day duck embryos were inoculated in the yolk sac with fixed rabies virus (CVS strain) and harvested after 12–14 days. The infected ground-up embryos were inactivated with 1:3000 beta propiolactone to form the vaccine which was tried out in veterinary students. 0·2 ml. of vaccine was given intradermally followed by doses of 0·02 ml. 5 and 10 days later. Sera taken 32–38 days after vaccination were tested in a serum-dilution neutralization test in mice. Sera negative in a test where serum-virus mixtures were incubated for 1½ hours at 37°C. were retested with incubation for 3 hours.

88% of the volunteers reported some reaction to the vaccine ranging from erythema (73%) to a febrile illness in one. Reactions were most severe after the second dose. There was no correlation between severity of reaction and subsequent antibody formation. Of 49 volunteers who had had 3 doses of vaccine at 5-day intervals, all except 12 had neutralizing antibody in the short test and 7 out of 7 of these 12 were shown to have antibody in the longer incubation test. Of 6 volunteers who had only 2 doses, 3 had antibody. Of 7 volunteers who had previously had another rabies vaccine and who had one dose of duck-embryo vaccine, all except one had antibody after vaccination. 22 of 45 of the volunteers who had had 3 doses, had antibody 171 days after and 43 of them showed an increase of antibody in response to a booster dose of 0·2 ml. The authors suggest that persons at risk should receive 3 doses and if then exposed to infection a booster dose is given. [For post-infection treatment, however, even a 4% failure rate is too high.] *C. E. Gordon Smith*

OSENINA, G. S. **A Study of the Aetiology of Neurological Disorders in Man following Antirabies Vaccination.** *J. Microbiol., Epidemiol. & Immunobiol.* London. 1959, v. 30, No. 5, 127–31. [Translated from Russian.]

On the aetiology of neurological disorders complicating antirabies vaccination in man no unanimity so far exists. Some authors stress the aetiological role of fixed rabies virus, others believe the complications to be of an allergic nature, and still others regard the paralytic disorders associated with antirabies vaccination as an atypical form of street virus rabies. In this article the author records the results of his studies on the aetiology of post-vaccination paralysis in 4 fatal cases. Biological tests for isolation of the virus were made on laboratory animals with brain material from the dead patients, and specimens of tissue from different parts of the central nervous system of those patients and from the brains of animals used in the transmission experiments were prepared and stained for histological examination. Results were assessed on the combined data provided by virological and histological findings.

All 4 patients had received courses of treatment with Fermi vaccine. The first 2 patients [cases 1 and 2] both bitten severely by a rabid dog, had been unable,

because of the onset of illness, to complete the intensive treatment prescribed. Case 1, with a diagnosis of diffuse encephalomyelitis, occurred in a 42-year-old patient who, after having shown signs of progressive bulbar paralysis, died 34 days after the commencement of treatment. Histological examination showed encephalitic lesions in the brain and signs of myelitis in the spinal cord, but failed to reveal the presence of Negri bodies in the brain. On application of the biological tests, street rabies virus was isolated. Mice inoculated intracerebrally with brain material showed, on first passage, signs of paresis on the 30th day and their brains, on later histological examination, proved to contain large numbers of Negri bodies in the cells of Ammon's horn ; in subsequent passages the incubation period shortened to 6–7 days and in these animals the central nervous system showed reactive changes characteristic of street rabies virus and large numbers of typical Negri bodies in the brain. Case 2, with a diagnosis of meningo-encephalitis, occurred in a 30-year-old patient who, after having developed complete paralysis of the right arm, died 28 days after the commencement of treatment. In mice inoculated intracerebrally with brain matter from this patient signs of paresis and paralysis were observed on the 12th–14th day; histological examination of the central nervous system of these animals revealed lesions characteristic of street rabies virus and large numbers of Negri bodies in the brain. In the second passage the mice became ill on the 7th–8th day with characteristic neurological signs; Negri bodies were again found in the brain of these animals. Case 3, one of Landry's ascending paralysis, occurred in a 51-year-old woman, who had come in contact with the saliva of a dog suspected of being rabid. On the day after completing the prescribed course of treatment, *i.e.*, 15 injections of vaccine, the patient developed paralysis of the right leg and on the following day paralysis of the left leg; thereafter her condition deteriorated and death took place 21 days after the last vaccine injection. Histological examination of the central nervous system of this case showed diffuse inflammation of the vessel walls and degeneration of many nerve cells in the brain, as well as areas of myelitis in the cord; no Negri bodies were found. Mice inoculated intracerebrally, subcutaneously and intramuscularly with brain matter from this case survived. No street or fixed rabies virus was isolated in a series of successive passages. Case 4, also one of Landry's ascending paralysis, occurred in a 65-year-old patient, who had been bitten by a clinically healthy dog and had commenced vaccine treatment on the following day. Treatment was badly tolerated and discontinued after a total of 11 injections had been given. 18 days after the commencement of vaccination, muscular weakness, amounting to quadriplegia, developed in the patient's limbs; thereafter the clinical course was typical of Landry's paralysis and death took place 23 days after the beginning of treatment. No pathological changes characteristic of rabies and no Negri bodies were found in the central nervous system of mice or rabbits inoculated with brain suspensions from this case, nor were the lesions seen in animals infected with fixed virus rabies observed in animals after first inoculation of these suspensions or after successive passages.

Cases 1 and 2, therefore, were examples of paralytic rabies due to street virus infection—the disease developing despite specific treatment. Cases 3 and 4 were expressions of a sensitization reaction to the nerve substance contained in the vaccine, *i.e.*, neuroparalytic accidents of antirabies treatment.

G. Stuart

NICOLAU, S. S., DRĂGĂNESCU, N., IONESCU, N. I. & ANDREESCU, M. Cercetări asupra conservării eficacității vaccinului antirabic "argintat". Studiu comparativ al acțiunii imunogene a vaccinului "argintat" si a vaccinului fermi. [**Investigations of the Preservation of the Effectiveness of Silver-treated Rabies Vaccine. A Comparative Study of the Immunogenicity of Silver and Fermi Vaccines**] *Studii si Cercetări Inframicrobiol.* 1959, v. 10, No. 3, 267–79. French summary.

The authors have previously found that a suspension of the Babes strain of fixed rabies virus inactivated with silver nitrate is an effective vaccine but that it lost its immunizing activity within 7 days of preparation, and in the present work it has been possible to prolong the period of activity. A 10% suspension of infected rabbit brain was made in 0·15% silver nitrate solution and kept at room temperature for 24 hours with frequent shaking. The supernatant fluid was then removed and the residue was suspended in 2 volumes of saline. The preparation thus obtained was no longer infectious when inoculated into mice intracerebrally. After storage at 4°C. for 48 days adequate protection against intracerebral infection was observed in mice vaccinated with the preparation intraperitoneally in 6 doses of 0·25 cc. at intervals of 2 days, and some protection was still observed after storage for 67 days and 3 months. In a comparative test carried out 48 hours after preparation the silver-treated vaccine was found to confer a considerably greater degree of protection than a standard vaccine of Fermi type. *D. J. Bauer*

HUYGELEN, C. & MORTELMANS, J. Pouvoir rabicide du sérum des ruminants après vaccination au moyen du virus Flury H. E. P. [**Rabicidal Power of the Serum of Ruminants after Vaccination with HEP Flury Vaccine**] *Bull. Soc. Path. Exot.* 1959, Nov.–Dec., v. 52, No. 6, 747–51. [13 refs.]

In the experiments described in this paper cattle, varying in age from 2 days to 12 years, and fully grown sheep were alike inoculated into the muscles of the neck with 2 ml. of a 40% chick embryo suspension of Flury virus at its 187th egg passage (HEP), the strain employed having a titre of $10^{-3\cdot8}$, determined by intracerebral inoculation into 4- to 6-day-old mice. The dosage administered to the ruminants was intentionally minimal, on the assumption that if an animal reacts to a small quantity of virus by significant antibody formation, evidence of virus multiplication in the organism is thereby indicated, whereas after the inoculation of a large quantity of virus the serum may show antibody formation without there having been multiplication of the virus. Serum was taken from all the animals at the time of vaccination and 1, 2 and 3 months thereafter; from 2 cows, proved to have reacted positively, sera were also taken 1 year after vaccination. From serum-virus neutralization tests performed with the various sera, neutralization indices were calculated. 5 of the 11 animals in the cattle group under test and 3 of the 5 sheep received a booster dose of 2 ml. of the vaccine intramuscularly 1 month after the first dose.

Results of the neutralization tests showed none of the pre-vaccination sera to contain antibodies. 1 month after vaccination 6 of the 9 bovine sera then examined showed a neutralization index of between 24 and 540, while 3 remained negative. 2 months after vaccination 6 of the 10 bovine sera then tested,

especially those taken from animals which had received a booster dose, gave markedly positive results, with titres at a much higher level than at the time of the first post-vaccination test. 3 months after vaccination the antibody titre in most of the bovine sera had fallen very considerably. Tests on sera taken 1 year after vaccination from 2 cows, which had previously reacted positively to the vaccination, showed in both cases a marked decline in antibody titre: from 4,100 to 6 in one serum and from 410 to 35 in the other.

With all the post-vaccination sera taken from sheep, neutralization tests were uniformly negative.

From these results the authors conclude that, having regard to the very small dosage of HEP Flury virus administered, the virus in all probability multiplies in cattle. Further, the complete absence of antibody formation in the sera of sheep inoculated with an identical dose of HEP Flury virus, permits the conclusion that, just as in man, HEP Flury virus does not multiply in sheep.

G. Stuart

SURDAN, C., DUMITRIU-CAROL, E., CURE, C. & ANGELESCU, N. Contribuţii la studiul complicaţiilor neuroparalitice postvaccinale antirabice la cîne. [**Neuroparalytic Complications after Antirabies Vaccination in Dogs**] *Studii si Cercetari Infranicrobiol.* 1960, v. 11, No. 2, 273–86, 9 figs. (5 on 3 pls.) [14 refs.] French summary.

The authors, in Rumania, studied 20 dogs which suffered paralytic accidents after rabies vaccine: only 6 had been vaccinated on previous occasions. The age, breed and sex were not relevant.

These complications occurred 10 to 40 days after an alum antirabies vaccine had been given and took the form of radiculitis, meningo-myelitis and meningo-encephalitis: there were also pleocytosis of the cerebrospinal fluid, granular neutrophilia (82%) and lymphopenia. The course of the condition took 1 to 15 days. 8 dogs were cured by treatment with cortisone, vitamins and antibiotics.

Macroscopically there were congestion and haemorrhage and microscopically demyelinating infiltrating neuritis and meningo-encephalitis and myelitis: the demyelination was largely perivascular.

No virus was isolated from the cerebrospinal fluid or by animal inoculation with suspensions of nervous tissue from dogs which had died.

The authors believe that those neuroparalytic accidents were of an allergic nature.

[Details of the 20 dogs are tabulated and there are photographs of the animals and photomicrographs of lesions.] *H. J. O'D. Burke-Gaffney*

VEERARAGHAVAN, N. & SUBRAHMANYAN, T. P. **Value of Antirabies Vaccine with and without Serum against Severe Challenges.** *Bull. World Health Organization.* Geneva. 1960, v. 22, Nos. 3/4, 381–91.

In a previous publication Veeraraghavan *et al.* [this *Bulletin*, 1958, v. 55, 754] reported on an experimental evaluation of serum, vaccine, and combined serum-vaccine methods of antirabies treatment in guineapigs challenged with from 1·3 to 16·8 LD50 of the NYC, Marimuthu and Masuli strains of street

virus. In the present paper the authors give a detailed account of further experiments carried out on guineapigs in an endeavour to assess the value of these different methods of treatment against severe challenge, to discover the optimum conditions under which combined serum and vaccine treatment might be expected to yield the best results, and to determine the extent to which the present dosage schedule of 5% Semple-type vaccine (2·1 ml. per lb. of body weight in severely exposed persons) could be reduced, when combined with serum therapy.

In these studies guineapigs of about 400 gm. weight were used in all protection experiments. Material for challenge purposes, in all but one experiment in which the Marimuthu strain was employed, was the lyophilized submaxillary gland suspension of a jackal infected in nature, strain J.154/56. Lederle's anti-rabies serum L (1,000 units per 10 ml.) was used in one experiment and serum PIC (prepared from horses at the Pasteur Institute, Coonoor) in the others; serum was always given intramuscularly, and against the same challenge the neutralizing antibody content of serum PIC proved to be about 5 times higher than that of serum L. The vaccine used for subcutaneous inoculation was obtained by pooling 12 batches of 5% Semple vaccine prepared from 12 sheep —a pooled vaccine which had been shown by Veeraraghavan [*ibid.*, 1959, v. 56, 716] to be superior in antigenicity to the NIH Reference Vaccine 155 D and to provide, when administered to guineapigs in a total dosage of 2·1 ml. (14×0·15 ml.), statistically significant protection against intramuscular challenge up to 105 LD50 of the J.154/56 strain of virus. In the present experiments the method of administering the challenge (0·1 ml. of the selected dilution of the virus given intramuscularly) and of determining the number of LD50 used was that described by Veeraraghavan *et al.*, [*loc. cit.*]. The results of the large-scale experimentation undertaken are summarized below.

Antirabies serum L or PIC administered locally into the leg or neck muscles 1 hour after intramuscular challenge with about 100 LD50 of the J.154/56 strain had no saving effect; the incubation period was, however, always prolonged.

Based on the results of vaccine treatment alone in the different experiments, the conclusion reached as regards the minimum dose of vaccine necessary to give significant protection, when administered on 14 consecutive days as from 1 hour after infection, was that a daily dose of 0·075 ml. seemed adequate against challenges up to about 50 LD50, while a daily dose of 0·15 ml. appeared to be more efficacious at challenges nearing 100 LD50. This conclusion emphasizes the need for administering a daily dosage of 10 ml. of vaccine on 14 consecutive days to severely exposed persons weighing 70 lb. and above, particularly when serum is not available.

With combined therapy it was shown that when the challenge was mild, *e.g.*, 9·4 LD50 of the Marimuthu strain, the administration of serum in addition to vaccine appeared to be without advantage. When the challenge was about 50 LD50 the protection conferred by combined therapy was better than that obtained with vaccine alone, but was not always statistically significant. Against challenges of about 100 LD50 vaccine, even when given in a daily dosage of 0·15 ml. on 14 consecutive days, did not afford consistently significant protection, whereas combined therapy invariably gave excellent protection. Against challenges of between 100 and 200 LD50 the protection conferred by combined therapy was moderately good, whereas vaccine treatment by itself was of no

value. When the challenge was 288 LD50 the protection with combined therapy was still significant (8 animals surviving out of 20 treated with serum combined with a daily dose of 0·075 ml. of vaccine, begun 1 hour after challenge with strain J.154/56). Against a challenge of 576 LD50 there was no protection. In further regard to combined therapy it was found that with a daily vaccine dose of 0·15 ml. there was no advantage in giving more than 0·25 ml. of a 1 in 25 dilution of PIC serum against a challenge of 105 LD50 of the virus strain J.154/56; moreover with that amount of serum there was no significant difference in the protection afforded by 14 doses of 0·15 ml. or 0·075 ml. of vaccine. This latter finding would suggest that with the recommended dose of 0·25 ml. of a 1 in 25 dilution of the serum, a safe minimum dosage of vaccine would appear to be a daily dosage of 0·075 ml. of vaccine per lb. body weight administered on 14 consecutive days. The fact that with the recommended dosage of serum the usual vaccine dose could be halved is obviously a matter of great importance in countries with a high incidence of neuroparalytic accidents after the administration of nervous tissue vaccine.

The results of further investigations into the value of combined therapy showed (a) that it did not seem possible to reduce the dosage of vaccine beyond a certain limit by increasing the dose of serum and (b) that delay in starting treatment resulted in the loss of the advantage conferred by serum in combined therapy. *G. Stuart*

CONSTANTINESCU, N., BÎRZU, N. & MICU, I. Cercetări asupra mecanismului activităţii protectoare a serului antirabic. [**Investigations of the Mechanism of the Protective Activity of Rabies Antiserum**] *Studii si Cercetări Inframicrobiol.* 1959, v. 10, No. 3, 297–304. [28 refs.] French summary.

Rabies immune serum with a neutralization index of 6 log units injected into mice intraperitoneally conferred complete protection against infection with fixed virus carried out by the same route 24 hours later; the animals were protected when the antiserum was given 2–4 hours after infection, but not when it was given later than 6 hours. Immune serum injected subcutaneously conferred protection against intraperitoneal infection when given 24 hours previously, but no protection was observed when given 48 hours after infection. The immune serum was less effective when infection was carried out by the intramuscular route, but gave some protection against infection with street virus under the same conditions. *D. J. Bauer*

CHOLERA

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

McGrew, R. E. **The First Cholera Epidemic and Social History.** *Bull. History of Med.* 1960, Jan.–Feb., v. 34, No. 1, 61–73. [Refs. in footnotes.]

Abou-Gareeb, A. H. **Cholera in Calcutta during the Season of Prevalence, 1959.** *J. Trop. Med. & Hyg.* 1960, May, v. 63, No. 5, 122–8.

The observations on which this study is based were made in Calcutta between March 1 and June 30, 1959. During this period there is annually an increased seasonal prevalence of cholera, but sporadic cases occur from time to time throughout the year. The author examined 143 patients with cholera and rectal swabs were taken from 101 of these and from 32 contacts. True cholera vibrios were isolated from 38 of the patients and from 3 of the contacts. Successful isolation of pathogenic vibrios seems to depend on the early collection of stool samples soon after the onset of the disease.

Data were collected regarding the environmental conditions under which the patients lived, with particular reference to water supply and the disposal of excreta. Cholera appeared to infect more particularly persons of 35 years and over, both sexes being equally affected in proportion to their numbers in the population. The incidence was greatest among those of low economic status, one-third of whom are described, for all practical purposes, as food handlers.

Factors favouring the spread of the disease are constant migration to and from localities outside the city, inadequacy of a safe water supply, overcrowding and lack of proper drainage and sewage disposal. *G. Covell*

Abou-Gareeb, A. H. **The Detection of Cholera Vibrios in Calcutta Waters: the River Hooghly and Canals.** *J. Hygiene.* 1960, Mar., v. 58, No. 1, 21–33, 4 maps. [18 refs.]

The author selected his water-collecting stations at points on the banks adjacent to areas of high cholera endemicity and where, it was estimated, pollution by cholera-infected stools would be high in consequence. Water samples of 2½–5 litres were filtered through special Kieselguhr pads and the pads were then cultured in an enrichment medium from which plate cultures were made for vibrio isolation and eventual identification. The study continued from December 1958 to August 1959 and out of a total of 89 samples collected, *Vibrio cholerae* was isolated from 12 of the specimens; 8 of the isolations were obtained from 26 samples collected from two points on the canal waters. The vibrio isolations were spread fairly evenly over the epidemic and inter-epidemic cholera periods and the bacteriological evidence regarding the continuous infectivity of the Calcutta waters throughout the year fitted in very well with the continuous incidence of clinical cholera over the whole period. The incidence of cholera in Calcutta continues over the year. At no period is the city free from infection and the open waters of the city are polluted throughout the year.

The relation of these two facts is discussed epidemiologically. The paper is of considerable interest.

The same author [this *Bulletin*, 1960, v. 57, 33] has offered valuable evidence about ritual bathing in Mosque "tanks" and cholera infections.

H. J. Bensted

GOTO, S., OTA, K. & KUWAHARA, S. **Studies on the Purine Requirements of Vibrio El Tor.** *Japanese J. Microbiol.* 1959, Apr., v. 3, No. 2, 223–30, 3 figs. [14 refs.]

A strain of El Tor vibrio was cultured in a semi-synthetic medium and its growth compared with that of an Inaba strain of cholera vibrio when various components were added to the medium.

Ammonium salts could not be utilized as the nitrogen source for either the cholera vibrio or the El Tor strain. The following vitamins—nicotinic acid, riboflavin, Ca pantothenate, biotin, thiamine, HC1, pyridoxine and folic acid—all inhibited the growth of the El Tor vibrio. The addition of adenine, guanine and xanthine each significantly enhanced the early growth of El Tor vibrios. Adenosine had a similar effect and there was little difference in the degree of stimulation of any of them.

When the production of haemolysin and growth of El Tor vibrios was compared for different media—casamino acid media containing adenine, xanthine and guanine respectively, salt-sugar solution containing 1% polypeptone, and nutrient broth—it was found that maximal growth was obtained in all cases in 24 hours while reduced growth with increasing haemolytic power was noted after 48 hours. Growth rates were better in all the three media containing purine, and toxin and haemolysin production was highest in the broth and next highest in polypeptone medium. Although the purine media showed such enhanced growth the haemolytic titres of these culture filtrates were about half of those from the peptone media and from one-half to one-quarter of those from broth cultures of El Tor vibrios.

H. J. Bensted

DE, S. N., GHOSE, M. L. & SEN, A. **Activities of Bacteria-Free Preparations from** *Vibrio cholerae*. *J. Path. & Bact.* 1960, Apr., v. 79, No. 2, 373–80, 3 figs. on pl. [11 refs.]

This paper is concerned with an extension of the work recently reported by De [this *Bulletin*, 1959, v. 56, 1028]. Bacteria-free filtrates of *Vibrio cholerae* from saline washings of agar growths show mucinase and haemolytic activities but they do not regularly give rise to a positive ligated-gut test in rabbits. Filtrates from 5% peptone-water cultures, on the other hand, consistently show enterotoxic activity in the ligated-gut test and also the presence of mucinase but these filtrates have no haemolytic property. The enterotoxic factor appears to be unrelated to mucinase or haemolysin production; the enterotoxic activity may be preserved at 2–4°C. for about 7 days but it is destroyed on exposure to 56°C. for 30 minutes.

Filtrates of washed suspensions of *V. cholerae* submitted to ultrasonic vibrations caused a significant fall of blood pressure in cats, but these filtrates showed

no evidence of mucinase, haemolytic or enterotoxic activity. The authors suggest that both exotoxin and endotoxin of the vibrio play a part in the pathogenesis of cholera.

H. J. Bensted

HALE, J. H., DAVIES, T. A. Lloyd & NG CHENG HIN, W. K. **Flies in Aeroplanes as Vectors of Faecal-Borne Disease.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1960, May, v. 54, No. 3, 261–2.

Cholera occurred in Bangkok in May 1958 and spread to 31 of the 71 provinces of Thailand, all in the south. During the epidemic two of the authors, during an air-flight from Bangkok to Singapore, noticed flies in the passenger cabin and, later, in the restaurant and waiting rooms at Bangkok airport: 12 flies were counted on a piece of fruit provided as refreshment in the airport.

During June–July, 43 aeroplanes arriving in Singapore from Bangkok were examined for flies in passenger and crew cabins after disembarkation and flies were found in all. The flies (*Musca domestica*) were trapped either alive or after pyrethrum spraying. In the first 4-day collections (9 aeroplanes) the flies were cultured individually for the presence of (1) *Vibrio cholerae*, (2) *Shigella*, (3) *Salmonella*, (4) faecal *Escherichia coli*, (5) *Streptococcus faecalis*. The subsequent 16 collections were grouped in daily collections and examined for (1), (2) and (3) only. The flies were incubated in peptone water and subcultures were made thereafter on appropriate selective media.

Flies were recovered from the flight deck, crew and passenger cabins, kitchen and pantry and closets. Faecal organisms were recovered from 9 of 34 flies in the first 4 collections, but cultures for (1), (2) and (3) were negative. In the second period 94 flies were recovered from 32 aeroplanes but no pathogenic organisms were isolated.

Thereafter, airline companies were asked to spray aircraft between Bangkok and Singapore and this was done during flight within 24 hours of reaching Singapore by means of pressure aerosol bombs containing pyrethrum and DDT. In the 3 following weeks, 48 aircraft were searched. 20 did not contain flies and 64 flies were caught in the remainder.

Evidently the flies had been in contact with faeces, but contamination in aeroplanes is unlikely as all employed well-designed chemical closets. The risk of flies carrying pathogenic organisms is clearly increased during an epidemic, but " whether flies become contaminated with *V. cholerae* is a numerical function ". The fact that all the aircraft contained flies increases the risk of flies acting as aeroplane-borne vectors across international boundaries. The risk was not abolished by special spraying during the flight from Bangkok to Singapore. Flies are difficult to kill, except by knock-down sprays, but as these are not suitable for aircraft when passengers are present, the authors suggest that strict control of flies should be enforced at all international airports.

H. J. O'D. Burke-Gaffney

CASELITZ, F. H. Laboratoriumsdiagnose der Cholera. [**The Laboratory Diagnosis of Cholera**] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1960, v. 11, No. 1, 109–30, [Numerous refs.]

A general review and discussion.

ADONAJŁO, Aniela, with the technical assistance of J. PIĄTKOWSKI. Odczyny poszczepienne i odczyny aglutynacyjne u ludzi szczepionych szczepionkami produkcji krajowej przeciw cholerze. [**The Post-Vaccination Reactions and Agglutination Reactions in Persons vaccinated against Cholera with Vaccines produced in Poland**] *Przegląd Epidemiol.* Warsaw. 1959, v. 13, No. 4, 379–91, 1 fig. English summary.

An investigation has been made of the post-vaccination reactions and the immune response observed in persons vaccinated with 4 types of cholera vaccine produced in Poland. The vaccines contained 8,000 million *Vibrio cholerae* of the Inaba and Ogawa strains per cc. and were given subcutaneously in doses of 0·5 and 1·0 cc., with an interval of 7 days. Phenolized, formolized, formolized centrifuged vaccine and formolized vaccine combined with TAB were each tested in 25 persons. Local and general reactions, which were often severe, were observed with all types of vaccine; the local reaction was usually more severe after the second injection, and the combined vaccine gave the most severe general reactions. Satisfactory agglutinin titres were observed with all 4 vaccines; the maximum titre was attained 2 weeks after the second dose and a considerable fall had taken place after 6 months. *D. J. Bauer*

AMOEBIASIS AND INTESTINAL PROTOZOAL INFECTIONS

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

REEVES, R. E. & FRYE, W. W. **Cultivation of *Entamoeba histolytica* with Penicillin-Inhibited *Bacteroides symbiosus* Cells. III. The Effects of Streptomycin.** *J. Parasitology.* 1960, Apr., v. 46, No. 2, 187–94, 2 figs.

A modified Shaffer-Frye medium (MS-F) which is fluid and contains *Bacteroides symbiosus* along with penicillin [this *Bulletin*, 1957, v. 54, 1412; 1959, v. 56, 830] has been used to study the effect of antibiotics upon the growth of *Entamoeba histolytica.* Streptomycin or dihydrostreptomycin sulphate was added to the culture medium at the time of inoculation with amoebae, in various amounts.

Concentrations of 0·05 to 0·5 mgm. per ml. adversely affected multiplication of amoebae, an effect which was reversed at higher concentrations and occurred with all strains of *E. histolytica* examined. The presence of the sulphate ion was not responsible for this effect and streptidine (a component of streptomycin) did not act like the antibiotic itself.

The isolation of fresh strains of *E. histolytica* in MS-F medium is described.

Reversal of the inhibitory effect by low concentration of the antibiotic occurred at higher concentrations, and when present in concentration of 3·7 mgm. per ml. the rate of growth of amoebae was increased beyond that occurring in controls. It is believed that this result arises from some metabolic effect of streptomycin on *B. symbiosus* inhibited by the penicillin present. In the absence of the latter the number of amoebae was reduced. Further experiments

suggested that the amoebae might have become dependent on streptomycin but this was not confirmed

These results are not due to the presence of sulphate ions nor are they brought about by the streptidine component of the antibiotic.

The presence of streptomycin beyond the period necessary for control of accompanying bacteria has facilitated isolation of new strains of amoebae.

J. D. Fulton

REEVES, R. E., LATOUR, Nelda G. & FRYE, W. W. **The Cultivation of *Entamoeba histolytica* with Penicillin-Inhibited Cells of *Bacteroides symbiosus*. IV. An Amino Acid Base Medium.** *Amer. J. Hyg.* 1960, Mar., v. 71, No. 2, 212–17.

Reeves *et al.* have previously reported on the use of media for growth of *Entamoeba histolytica* which can be altered at will to allow evaluation of the component parts [this *Bulletin*, 1957, v. 54, 1412; 1959, v. 56, 830]. The present report deals with the replacement of casein hydrolysates with combinations of pure amino-acids. HANSEN and ANDERSON had previously reported on an essentially synthetic liquid medium for culture of this organism in which 12 amino-acids, vitamins etc. were present [*ibid.*, 1949, v. 46, 40]. The amoebic culture used here had been grown in association with *Bacteroides symbiosus* inhibited by penicillin. The composition of one successful medium is given in a table and contains only 3 amino-acids along with glucose, salts and small amounts of horse serum, pantethiene and *B. symbiosus* with 5,000 units penicillin G. No specific requirements for free amino-acids in the culture medium were noted. The authors believe that nutritional needs may have been met by the proteins present.

J. D. Fulton

PIMENTO DE MELLO, R., SANTA ROSA, G. & DE ALMEIDA LOPES, P. F. Recentes técnicas para coloração de protozoários em tecidos. [**New Technique for Staining Protozoa in Tissues**] *Mem. Inst. Oswaldo Cruz.* 1958, Dec., v. 56, No. 2, 571–5, 3 figs. English summary (5 lines).

After testing various methods for staining intestinal protozoa in tissues, the authors have found two to be most satisfactory. In both, the material containing the parasites is fixed in Zenker, Zenker-formol or in formol, and the preparation is stained with the following nuclear stain (after GOLDMAN this *Bulletin*, 1949, v. 46, 502): (a) 1% solution of haematoxylin in 95% alcohol, (b) 4 gm. ferric ammonium sulphate, 1 ml. glacial acetic acid, 0·12 ml. concentrated sulphuric acid, 100 ml. distilled water; solutions (a) and (b) are mixed in equal parts, kept overnight, and filtered, after which the stain can be used for 6 days.

For staining the histological elements, the following stains are used:

(1) 5 ml. of 1% acid fuchsin, 95 ml. saturated aqueous solution of picric acid, and 0·25 ml. of concentrated hydrochloric acid. After staining in the nuclear solution (a + b) for 3–5 minutes, the preparation is washed in running water for 5 minutes and stained in (1) for another 5 minutes, after which it is dehydrated and mounted: this method produces excellent results in the case of *Entamoeba histolytica.*

(2) Gomori's trichrome, consisting of 0·6 gm. " Chromotrope 2R ", 0·3 gm. of light green SF or fast green FCF, 0·7 gm. phosphotungstic acid, 1 ml. glacial

acetic acid, 100 ml. distilled water. This mixture is diluted in 2 parts of distilled water and the preparation is stained for 10 minutes, in the case of *Balantidium coli*, and for 24 hours in the case of *Giardia intestinalis*. This method is particularly suitable for these two parasites. *C. A. Hoare*

VRANCIC, Jirina & MIMICA, M. Nalaz entamebe histolitike kod kroničnog horioretinitisa. [**The Association of Chronic Chorioretinitis with Amoebiasis**] *Radovi Med. Fakul. Zagrebu.* 1959, v. 7, No. 2, 149–53.

The English summary appended to the paper is as follows:—

"In 64 examined cases of chronic chorioretinitis Entamoeba histolytica was found in the stools of 24 patients *i.e.*, in 37%.

"In 50 cases of other ophthalmologic conditions this organism was found in 4 cases (8%), and in 100 'normal' persons in 9 cases (9%).

"The increased frequency of findings of E. histolytica in chronic chorioretinitis is significant.

"It has been suggested that E. histolytica could play a role in the pathogenesis of some cases of chorioretinitis, probably by the way of the so-called 'endo-allergens.'"

DE CARNERI, I. & COPPI, G. A clorofenoxamida como possível quimioprofilático antiamebiano. [**Chlorophenoxamide as a possible Anti-Amoebic Chemoprophylactic Agent**] *Rev. Inst. Med. Trop. São Paulo.* 1960, Jan.–Feb., v. 2, No. 1, 8–16, 2 figs. [30 refs.] English summary.

Chlorophenoxamide is N(beta-oxyethyl)-N(phenoxy(4′ nitro) benzyl) dichloracetamide and *in vitro* is 10 times more active on *Entamoeba histolytica* than emetine or fumagallin [this *Bulletin*, 1958, v. 55, 1013], while its action is very highly specific. It is only slightly soluble in water, very little is absorbed from the intestinal tract, and it is practically non-toxic.

Clinical trials were made on volunteers in which the preparation called Mebinol was used. The patients received varying amounts of the drug either twice a week or daily. No untoward effects were noticed and as a result of the experiments the authors consider that the administration of 1 x 250 mgm. tablet of chlorophenoxamide produces an amoebicidal concentration in the gut for more than 2 days in most cases, and that 1 weekly dose would be sufficient to kill recently ingested *E. histolytica*. For prophlyaxis they recommend 1 x 250 mgm. tablet per day for 2 consecutive days each week, for subjects in an endemic area, or a daily dose of 1 tablet when the disease is prevalent.

[See also *ibid.*, 1960, v. 57, 371]. *W. K. Dunscombe*

SIMITCH, T., CHIBALITCH, D., PÉTROVITCH, Z. & HENEBERG, N. Contribution à la connaissance de la faune des protozoaires intestinaux du porc de Yougoslavie. Leur identification expérimentale. [**Intestinal Protozoa of Pigs in Yugoslavia: their Experimental Identification**] *Arch. Inst. Pasteur d'Algérie.* 1959, Sept., v. 37, No. 3, 401–8. [14 refs.]

In view of the uncertainty regarding the nature and specific identity of porcine intestinal protozoa, about which controversial views are held, the authors carried out a study of the protozoal fauna in faecal specimens obtained from 1,800 pigs in the Belgrade slaughter houses. The morphology of the parasites was studied in fresh and iodine preparations, as well as in culture, while their host-parasite relations were determined by experimental infection.

The results were as follows. *Iodamoeba* isolated from 156 pigs was morphologically indistinguishable from the human species, *I. bütschlii,* but the porcine and human strains were not interchangeable between the 2 hosts, on account of which the name *I. suis* O'Connor, 1920, is restored for the parasite of pigs. *Endolimax* was found in 51 pigs. Having failed to infect piglets with human *E. nana,* the authors conclude that the porcine strain is a distinct species, for which the name *E. suis* n.sp. is proposed. The pigs also harboured 2 forms of *Entamoeba* producing uninucleate cysts: a large species, identified as *E. suis* and a small one—*E. debliecki.* The authors found no evidence of infection with *E. histolytica* in the pigs examined by them. Moreover, they failed to infect pigs with this species, as well as with *E. coli* and *E. hartmanni* isolated from man.

The pigs were also infected with flagellates similar to the human parasites, *viz., Trichomonas, Chilomastix* and *Tricercomonas.* Since the porcine *Trichomonas* failed to infect a volunteer, and the human parasites, *Chilomastix mesnili* and *Tricercomonas hominis,* were not infective to pigs, the porcine strains are regarded as independent species: *Trichomonas suis, Chilomastix suis* n.sp. and *Tricercomonas suis* n.sp. *Balantidium coli,* found in over a thousand of the pigs, is considered to be identical with the human parasite, which is commonly encountered in Yugoslavia. It is suggested that pigs are reservoirs of human infection. Finally, most of the pigs harboured *Eimeria debliecki.* *C. A. Hoare*

McQuay, R. M., Jr. *Chilomastix mesnili* **Encystment** *in vitro. Proc. Soc. Exper. Biol. & Med.* 1960, Apr., v. 103, No. 4, 838.

"Encystment of *Chilomastix mesnili* was observed in cultures of 9 stool specimens which had been placed in diphasic charcoal medium."

Robin, L. A. & Fondimare. Un cas de coccidiose intestinale humaine à *Isospora belli* (Wenyon, 1923). [**A Case of Human Intestinal Coccidiosis due to** *Isospora belli*] *Bull. Soc. Path. Exot.* 1960, Jan.–Feb., v. 53, No. 1, 35–8.

The patient was seen in Rouen, but had recently returned from North Africa.

RELAPSING FEVER AND OTHER SPIROCHAETOSES

LARIVIÈRE, M., HOCQUET, P. & CAMERLYNCK, P. Effet protecteur de *Borrelia crocidurae* sur des souris infectées par une souche virulente de *Trypanosoma gambiense*. [**Protective Effect of** *Spirochaeta crocidurae* **on Mice Infected with a Virulent Strain of** *Trypanosoma gambiense*] *Bull. Soc. Méd. Afrique Noire Langue Française*. Dakar. 1960, v. 5, No. 1, 56–60, 2 charts.

The following is a translation of the authors' summary:—

Spirochaeta crocidurae isolated from the brain of *Cricetomys gambianus* and maintained in mice exerts in that animal some protective effect against a virulent strain of *T. gambiense*. While control mice died regularly in 4 to 5 days, survival averaged 30 to 40 days in mixed infections. This confirms the findings of GALLIARD *et al.* [this *Bulletin*, 1960, v. 57, 375] and shows that *Sp. crocidurae* in this respect has the same protective power as *Sp. duttoni* against *T. gambiense*.

H. J. O'D. Burke-Gaffney

BLANC, G., ASCIONE, L. & CRIMBITHIS, E. Existence de *Borrelia merionesi* Blanc et Maurice chez les mérions, *Meriones shawi*, V. Grandis, du territoire de Bab er Rhob à Marrakech. [**Presence of** *Spirochaeta merionesi* **in** *Meriones shawi* **in the Bab er Rhob Area in Marrakech**] *Arch. Inst. Pasteur. du Maroc*. 1959, v. 5, No. 10, 714–25, 7 figs. on 5 pls.

LEPROSY

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

WORTH, R. M. **Leprosy in Children born at Kalaupapa.** *Hawaii Med. J.* 1960, Mar.–Apr., v. 19, No. 4, 403–6, 3 figs.

The leprosarium at Kalaupapa in the Hawaii Islands offers facilities for a particularly interesting study of the infection of children with leprosy. Between 1880 and 1949 some 642 children were born at Kalaupapa of whom only 505 survived the first year of life. The author adds: "This is a commentary on the status of sanitation and infant care during the era when most of these children were born (prior to 1930)".

The policies adopted in the prevention of child infection may be divided into 4 periods. (1) The first includes 1866 (when Kalaupapa was established) to 1879 when the records were incomplete, and 1880 to 1889 when the records were "of questionable reliability"; (2) from 1889 to 1900 when there was a 42% infection rate. During these two periods the children were left with their parents until they were weaned or even longer. (3) In the period 1900 to 1929 children were removed at birth and kept in a nursery at Kalaupapa where they were visited periodically by the parents but were separated from them by a pane of

glass. This resulted in the infection rate being reduced to approximately 13%. (4) Since 1929 the policy has been to remove the child from the mother at birth and from Kalaupapa within the first few days of life.

From 1930 to 1949 there have been 77 children born, and up to 1959 none of them has been diagnosed as suffering from leprosy though all were kept under observation. It is noticed that even under maximal infection conditions about 60% of the children failed to develop recognizable leprosy, which supports the view "that the resistance of the individual has a great role to play in epidemiology of this disease". The onset of leprosy in the great majority was between 5 and 14 years. The rate of attack of boys was twice that of girls. It is remarked that there is strong evidence that transmission of leprosy does not take place during the prenatal or perinatal period. *Ernest Muir*

COURMES, E. & BENTZ, H. Construction de diagrammes protéiques dans la maladie de Hansen. [**Construction of Protein Diagrams in Leprosy**] *Bull. Soc. Path. Exot.* 1960, Jan.–Feb., v. 53, No. 1, 47–56, 2 figs.

The authors investigated the serum proteins in leprosy and describe them graphically in a diagram. 95 patients were seen in Guadeloupe. It was noteworthy that in the lepromatous type 64% presented with a raised thymol turbidity and that the corresponding figure in the tuberculoid type was only 32%. There was a tendency for the fibrinogen to be low and for the albumin/globulin ratio to be low also. The alpha globulins were not raised. Kunkel's phenol test, in which a turbidity is produced which is roughly related to the lipoproteins, also showed results below normal. Here the tendency to abnormal results was greater in the tuberculoid type (43%) than in the lepromatous type (25%). The gamma globulins were significantly raised in nearly 90% of the patients. *H. Lehmann*

MA, Hai-Teh, FAN, Lien-Chieh & MA, Chao-Hsiang. [**The Biological Pseudo-Positive Serological Test for Syphilis in Leprosy**] *Vestnik Dermat. i Venerol.* Moscow. 1960, v. 34, No. 4, 54–9. [11 refs.] [In Russian.]

The English summary appended to the paper is as follows:—

"Serological testing of 1,016 leprosy cases with a battery of four serological tests for syphilis was performed. An analysis of the results shows a 5·9% false positive rate, the largest number occur in lepromatous cases and are encountered more often in leprosy in a state of reaction. A comparison has been made with results as found in the literature on this subject. The false positive tests, when occurring in leprosy sera, tend to be weak or dissociated. Changes in the sera of leprosy patients are discussed. Antileprosy treatment does not seem to affect BFP rates, but the sex and duration of the disease play a certain role."

LOGUINOV, V. & EFIMOV, I. [**The Influence of the Sulphones on the Cardiovascular System of Patients with Leprosy**] *Sbornik Nauchnikh Rabot Po Leprologii i Dermatologii No. 13.* Rostov-on-Don. 1959, 48–51. [In Russian.] French summary (5 lines).

The authors have observed the occurrence of symptoms indicative of disorders of cardiac function in patients suffering from leprosy while under treatment for

long periods with Sulphetrone [selapsone] and diaminodiphenylsulphone. In more detailed investigations studies were made of changes in the electrocardiogram in 47 patients with leprosy who had suffered from the disease for up to 20 years or more; 45 patients were receiving Sulphetrone, 1 Sulphatin and 1 diaminodiphenylsulphone suspended in Moogrol. Electrocardiograms were taken before or at the beginning of treatment, and again at the end of the course, with leads I–II and in most cases also CR_{1-6}. Abnormalities were observed in 22 patients, including sinus bradycardia (7 cases), ventricular extrasystoles (2 cases), and evidence of myocardial hypoxia (16 cases). 3 case histories are given in illustration. It is therefore concluded that the sulphones have a side effect upon the cardiovascular system, and that drugs to counteract this should be included in the complex of measures used in treating leprosy. *D. J. Bauer*

HADLER, W. A. **The Action of Electronegative Colloidal Particles on the Inflammatory Reaction induced by** *Mycobacterium leprae* **and** *M. lepraemurium* **in Rats, Guinea Pigs and Rabbits.** *Rev. Brasileira Leprologia.* S. Paulo. 1959, Jan.–Mar., v. 27, No. 1, 9–15, 1 fig. [22 refs.]

Suspensions of heat-killed *Mycobacterium leprae* or *Myco. leprae-murium*, with and without suspensions of Prussian blue, Trypan blue or carbon, were injected either intraperitoneally or intracutaneously into rats, guineapigs and rabbits, and at intervals up to 40 days the animals were killed and the lesions in the omentum, lymph nodes, spleen, liver and skin were examined histologically.

In the rat, when injected with the particle-free suspensions, the lesions were essentially lepromatous, the macrophages being numerous and active, and there was little or no lysis of the bacilli; but when the suspensions contained the electro-negative particles, the lesions were more localized and tuberculoid in character, containing many epithelioid cells. In contrast to these effects of the electro-negative particles on the lesions in the rat, in the guineapig and rabbit the presence of the particles slowed down the lysis of the bacilli, thus delaying the evolution of the disease.

The author suggests that the acceleration effect in the rat is due to the particles activating lytic enzymes. *S. R. M. Bushby*

KAWAGUCHI, Y. **Classification of Mouse Leprosy.** *Japanese J. Exper. Med.* 1959, Dec., v. 29, No. 6, 651–63, 2 text figs. & 4 figs. on 2 pls. [20 refs.]

" As a result of examining the susceptibility of various inbred strains of mice to subcutaneous inoculation with murine leprosy bacilli, the author considered that mouse leprosy should be classified in two polar types, benign and malignant, on the basis of clinical features of skin lesions. The skin lesion of the former type, in the C57BL/6 strain, appears early but is small, hard and sharply defined, whereas that of the latter type, in the C3H strain, develops later but is much larger and soft with a diffuse thickening appearance.

"Many findings were made from various types of mouse leprosy experiments. Investigations with BCG vaccination and the course of mouse leprosy were of much interest and the results are evaluated in accordance with a new classification.

"In consequence, it is emphasized that mouse leprosy experiments are a tool for human leprosy research. This classification presented may contribute to progress in leprosy research."

FEGELER, F. Günstige Wirkung von Kanamycin bei experimenteller Rattenlepra. [**Good Effect of Kanamycin in Experimental Rat Leprosy**] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1959, Dec., v. 10, No. 4, 447–9, 1 fig.

A leproma of 5 months' standing was removed aseptically from a rat and suspended in sterile saline with an Ultra-Turrax (presumably a blender). This suspension was injected, partly subcutaneously and partly intramuscularly, into the region of the shoulder in 16 rats: 30 days later kanamycin treatment was begun in 8 of them, 3 mgm. being injected daily for 3 weeks and 6 mgm. for 10 weeks. In the text and table the size of the lesions is denoted as that of a lentil, pea, bean, cherry or plum: in a figure it is represented more quantitatively. In the control rats the lesions increased progressively in size, 5 attaining "plum" dimensions; in the treated they shrank, 5 disappearing and 3 ending as "lentils". Body weights are also charted; these show little difference.

L. P. Garrod

HELMINTHIASIS

In this section abstracts are arranged as far as possible in the following order:—TREMATODES (*schistosomes, other flukes*); CESTODES (*Diphyllobothrium, Taenia, Echinococcus, other cestodes*); NEMATODES (*hookworms, Ascaris, filarial worms, Dracunculus, etc., Trichuris, Enterobius, Trichinella, etc.*).

BIAGI F., F., PINZÓN, O. & MARTUSCELLI Q, A. **Control of Vomiting due to Dithiazanine, an Antiparasitic Drug.** *Rev. Inst. Med. Trop. São Paulo.* 1960, Jan.–Feb., v. 2, No. 1, 37–40.

In a previous clinical trial of this most valuable anthelmintic drug the authors have recorded an incidence of vomiting of 10·9%, which detracted from its usefulness [this *Bulletin*, 1960, v. 57, 719]. They therefore prepared tablets with 3 different coatings and tested these, together with the commercially marketed tablet, in a "double-blind" clinical trial on 318 patients suffering from various helminthic infections. Tablet A had multiple coatings of methylcellulose, tablet B multiple coatings of polyvinyl-pyrrolidone and tablet C multiple coats of

methylcellulose applied with a special granulation. The dosage used was 10 mgm. per kgm. body weight (not exceeding 600 mgm.) daily for 5 days.

Before treatment faecal egg counts were made by the Ferreira technique, and the load expressed as a mean of 3 counts, and the same estimation was repeated 8 days after the completion of the course. A reduction in egg count of 70–100% after treatment was considered to indicate an effective preparation.

The 4 preparations of dithiazanine showed no significant difference in their anthelmintic efficiency, which was rather low in the case of hymenolepiasis, ascariasis, trichuriasis and hookworm infections, but very high in strongyloidiasis. In the incidence of vomiting and other side effects, comprising nausea, giddiness and abdominal pain, preparations A, B and C all proved much superior to D, the commercial tablet, A being the best tolerated.

J. H. Walters

NAJARIAN, H. H. **Maintenance and Rearing of the Snail** *Bulinus truncatus* **in the Laboratory.** [Research Notes.] *J. Parasitology.* 1960, Apr., v. 46, No. 2, 153.

The author, from the University of Texas, describes a simple method of rearing *Bulinus truncatus,* which he used while he was with the WHO Bilharziasis Control Project in Iraq in 1958. It has the merit of requiring no vegetation, mud, sand or water additives, and the only dietary item used was either boiled lettuce or spinach.

The snails were kept in non-aerated Baghdad tap water, changed daily and varying in volume from 30 to 150 ml. per snail, as required, for example, when 30 snails were isolated individually in small dishes and followed for 33 days, a volume of 30 ml. per snail was used: in another experiment 47 snails in 4 groups were in rectangular aquaria and in this case 150 ml. of water per snail were employed. Stock snails were kept in large circular aquaria, with 100 ml. per snail, from March to December at water temperatures of 15·5 to 25·5°C.

The amount of lettuce or spinach given was such that little or none was left over at each daily change of water and this amount was soon determined by trial and error. Excess food should not be given, as it causes the snails to surface and crawl out of the containers. Covers are required only for individual isolation in a small volume of water.

Egg-laying occurred throughout the year, almost entirely on the glass surfaces but occasionally on snail shells and remnants of uneaten lettuce. At the temperatures experienced, hatching took place at limits of 8 to 19 days after oviposition. Newly hatched snails were readily reared on the same diet, in tap water only. The number of deaths was negligible. *H. J. O'D. Burke-Gaffney*

JOPLING, W. H. **Schistosomiasis (Bilharziasis).** *Brit. J. Clin. Practice.* 1958, Mar., v. 12, No. 3, 151–9. [20 refs.]

A general account of usual and unusual sites of lesions and review of the literature.

FALCÃO, Edgard de Cerqueira. **Pirajá da Silva. O incontestável descrobridor do *Schistosoma mansoni*.** Preface by Mário PINOTTI. 314 pp., numerous illustrations. 1959. Santos: Caixa Postal 796, Brazil.

This large monograph extends the previous work and compilations by the author on Professor Pirajá da SILVA and his original descriptions of *Schistosoma mansoni* in 1908 [this *Bulletin*, 1958, v. 55, 350].

The author took the opportunity presented by the 50th anniversary of that event to write a fuller account of the life and work of Pirajá da Silva and the present monograph includes this feature together with many other papers.

The first part contains the history of da Silva's observations of lateral-spined eggs in the stools of patients in Bahia and the events which followed from it: this is followed by a bio-bibliographical sketch of Parajá da Silva himself. Both of these are also presented in English translation. There are then set out reproductions of 22 original documents, including diplomas, appointments and honours received by Pirajá da Silva.

The second part reproduces papers published by da Silva between 1908 and 1942 on such varied subjects as syphilis, amoebiasis, Chagas's disease, leishmaniasis, mycosis and various entomological observations.

The third part is devoted to the jubilee celebrations and gives a record of meetings in Bahia and São Paulo in December, 1958, together with an account of the commemoration of the event by the " Medalha Cultural Pirajá da Silva ", which was instituted under the joint auspices of a number of Brazilian learned societies. There is a photograph of the medal and of a commemorative postage stamp. This is followed by a reprint of a paper on Pirajá da Silva's discovery, from the *Folha de Manhã* of December 1958, reproduction of letters from Afrânio do Amaral of the Butantan Institute between 1919 and 1921, and a short note on the validity of the generic name *Schistosoma*, accompanied by a reproduction in full of the relevant Opinion 226 of the Opinions and Declarations of the International Commission on Zoological Nomenclature.

[The author has informed the Editors that this book may be obtained free from him by interested persons, at Caixa Postal 796, Santos, São Paulo, Brazil.]

H. J. O'D. Burke-Gaffney

PITCHFORD, R. J. **The Value of Triostam in the Treatment of Schistosomiasis.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1960, Mar., v. 54, No. 2, 178–9.

Triostam has given good results in the treatment of *Schistosoma haematobium* infections in Africa [this *Bulletin*, 1954, v. 51, 1171; 1957, v. 54, 306]. There do not appear to have been many trials with this drug against *S. mansoni*.

The author, from the Bilharzia Field Unit, Transvaal, tried this drug on 60 African schoolchildren aged 6 to 15 years having double infection with *S. haematobium* and *S. mansoni*, 34 of whom completed full courses of treatment.

The drug was supplied in vials of 1·2 gm. sodium antimony gluconate containing 36% trivalent antimony for intravenous use. It was dissolved in 21·5 cc. sterile distilled water and given daily in the schedules shown below. Chances of reinfection were present throughout. Follow-up began in the 4th week after the end of treatment; in the 4th and 5th weeks 3 very thorough examinations of

urine and faeces were made; any positive faeces were examined again in the 6th week for viable ova (motile miracidia); ova were very scarce in the faeces in the 4th–5th weeks; but were found very easily in the 6th week. The results were as follows: —

Dose	Number of patients	Number positive, 4, 5, or 6 weeks after treatment complete	
		S. haematobium	*S. mansoni*
223 mgm. × 6	3	0	0
223 mgm. × 5	11	0	2
334 mgm. × 4	20	0	6

The author notes: (1) the poor response of Africans to a series of injections; nearly half of these patients did not complete the course. This makes mass treatment of Africans in this way of doubtful value, as the author has noted previously [*ibid.*, 1958, v. 55, 1345]; (2) the marked difference in response of the two worms. Chances of infection before treatment were equal in the case of both parasites. The author concludes that *S. mansoni* does not respond as well to Triostam as does *S. haematobium*.

The only side reaction was a bout of severe coughing in a small boy whose dose was increased because he had missed the previous one. This procedure was not repeated.

The author adds in a footnote that of 10 Europeans (adults and children) examined 2–3 months after Triostam treatment, all but one had viable *S. mansoni* in their stools. All had single *S. mansoni* infections and there was no question of reinfection. *H. J. O'D. Burke-Gaffney*

PRATA, A. & MACHADO, R. Alterações pulmonares observadas no tratamento antimonial da esquistossomose. [**Pulmonary Changes occurring during Antimonial Therapy of Schistosomiasis**] *Rev. Inst. Med. Trop. São Paulo.* 1960, Jan.–Feb., v. 2, No. 1, 29–36, 5 figs. English summary.

The authors describe conditions found in 4 patients among about 1,000 being treated by antimonials for *Schistosoma mansoni* infections, who after being examined by X-ray because of a lung condition showed definite radiological changes, and also 3 others who showed similar lung changes after treatment with Sb. The chest X-rays showed no uniform picture; there were diffuse nodular formations, or infiltrations without definite margins, in different parts of the lungs and these symptoms were very much more evident than the pulmonary manifestations usual in patients being treated with antimonials. Crepitant râles were often found on auscultation. The condition was benign and disappeared within 4–16 days, and in those patients in whom they were used, neither penicillin, streptomycin, nor steroids had any effect. The condition resembled Löffler's syndrome (eosinophilic pneumonitis) although the lesions did not necessarily occur in the neighbourhood of a worm, but all the patients had a high eosinophilia.

After considering various possible causes the authors regard the treatment with the trivalent antimonials as responsible. *W. K. Dunscombe*

FERGUSON, F. F., RICHARDS, C. S., SEBASTIAN, S. T. & BUCHANAN, I. C. **Natural Abatement of Schistosomiasis mansoni in St. Kitts, British West Indies.** *Pub. Health.* 1960, Apr., v. 74, No. 7, 261–5. [14 refs.]

Schistosoma mansoni was probably introduced into St. Kitts by African slaves, and potential snail hosts existed there. In 1932 the incidence of human infection was estimated at about 25%, though more thorough examination would probably have brought the figure up to 50%. Infection occurred not only as a result of man-made pollution, but also from a monkey cycle in the mountains, from which cercariae entered into the streams.

Now the human disease seems to have gone, the decline in incidence having taken place in the past decade; it is not known whether the monkeys still have it, but it is likely that they are clear. The level of rural health has been significantly raised as a result.

This disappearance of schistosomiasis is put down to unplanned environmental changes. Water has been piped and conserved, and streams have been guarded. Two applications of sodium pentachlorophenate in stream headwaters were ineffective in that snails returned after temporary disappearance; the control snail *Marisa cornuarietis* has been established in one watercourse.

The authors admit, however, that " no utilisable instrument may be forged on the basis of these epidemiological disclosures for the control of this disease elsewhere ". *Charles Wilcocks*

HUNTER, G. W. **The Use of Anticoagulants and Chlorobutanol for the Recovery of Adult Schistosomes from Mice.** [Research Notes.] *J. Parasitology.* 1960, Apr., v. 46, No. 2, 206.

The author, from the College of Medicine, University of Florida, found the Perf-O-Suction technique of RADKE *et al.* [*J. Parasitology*, 1957, v. 43 (supp.), 26] superior to other methods for perfusing small animals to recover *Schistosoma mansoni*; but as in the case of other methods it was difficult to remove adult *Schistosomatium douthitti*, especially from the smaller mesenteric vessels, and to make worm counts without the tedious process of teasing the parasites out of the vessels, with the use of a dissecting microscope.

The author has used, in addition to such anticoagulants as citrates and heparin, intraperitoneal injection of test mice with 7·5 mgm. of chlorobutanol in 0·5 cc. distilled water. The anaesthetic caused considerable relaxation of the parasites and facilitated their easy removal by the suction technique referred to above. The perfusion itself was also facilitated as the mice were anaesthetized, and ether was therefore unnecessary.

Careful examination of liver, intestine and attached blood vessels removed after perfusion demonstrated the accuracy and effectiveness of the technique, since only one parasite was detected in a series of 46 perfusions.

H. J. O'D. Burke-Gaffney

HSÜ, H. F. & HSÜ, S. Y. L. **The Infectivity of Four Geographic Strains of *Schistosoma japonicum* in the Rhesus Monkey.** [Research Notes.] *J. Parasitology*. 1960, Apr., v. 46, No. 2, 228.

The Formosan strain of *Schistosoma japonicum* is a non-human strain [this *Bulletin*, 1957, v. 54, 314] and the Formosan monkey is not susceptible to it [*ibid.*, 1956, v. 53, 1360], though the Japanese and Philippine monkeys are fairly good hosts. Formosan monkeys are not easily obtained outside Formosa and the authors, from the State University of Iowa, therefore used rhesus monkeys for trials of infectivity of the 4 geographical strains of *S. japonicum*, namely the Chinese [C], Formosan [F], Japanese [J] and Philippine [P].

Cercariae of each strain were obtained from appropriate snail hosts. 400 freshly shed cercariae, with the sexes balanced, were given cutaneously to each of 7 monkeys (4 lb. weight). One monkey was infected with C strain, one with J, one with P and 4 with F. From the 30th day stools were examined daily for eggs by a sedimentation method. 2 albino mice were also infected with 200 cercariae of the Formosan strain.

In the monkeys infected with the C, J and P strains schistosome eggs were found in the stools on the 39th, 33rd and 35th days. The 4 monkeys infected with the F strain were negative throughout 70 days of daily examination: on the other hand, the 2 mice showed schistosome eggs on the 42nd day.

Evidently the rhesus monkey, *Macaca mulatta*, like man and the Formosan monkey, *M. cyclopis*, is resistant to the Formosan strain of *S. japonicum*, but susceptible to the other 3 strains. *H. J. O'D. Burke-Gaffney*

SHORT, R. B. & MENZEL, Margaret Y. **Chromosomes of Nine Species of Schistosomes.** *J. Parasitology*. 1960, June, v. 46, No. 3, 273–87, 4 pls. [50 refs.]

PANTELOURIS, E. M. & GRESSON, R. A. R. **Autoradiographic Studies on *Fasciola hepatica* L.** *Parasitology*. 1960, May, v. 50, Nos. 1/2, 165–9, 7 figs. on pl.

GOVAERT, J. Etude cytologique et cytochimique des cellules de la lignée germinative chez *Fasciola hepatica*. [**Cytological and Cytochemical Study of the Germinative Cells of *Fasciola hepatica***] *Exper. Parasit.* New York. 1960, Apr., v. 9, No. 2, 141–58, 6 figs. [35 refs.]

LAMMLER, G. Die Chemotherapie der Fasciolose. III. Mitteilung. Über die experimentelle *Fasciola hepatica*-Infektion der Albino-Ratte. [**Chemotherapy of Fascioliasis. III. Experimental Infection with *Fasciola hepatica* in Albino Rats**] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1959, Dec., v. 10, No. 4, 379–84, 2 figs.

Eggs of *Fasciola hepatica* were obtained from adult worms taken from the livers of slaughtered cows. These were used to infect snails from which cercariae were eventually obtained which could be used to infect small animals. Rats were

infected through an oral cannule with 10–20 cysts of the parasite. With albino rats 65–75% of the inoculated animals survived, with cotton rats only 13% and with golden hamsters only 7%. Eggs were found in the faeces of the rats 8 weeks after the original oral administration of cercariae. In some rats the worms caused degeneration and cirrhosis of the liver. The sexually mature adult worms sit in an enlargement of the descending bile duct.

Preliminary tests were made with hexachlorethane and these showed that the rat provides a chemotherapeutic test as sensitive as the rabbit for compounds against *F. hepatica*; and rats are much cheaper than rabbits.

[This paper has many technical details which will interest those making chemotherapeutic tests *in vivo*.] *F. Hawking*

GLEASON, Neva N. **Human Sparganosis in Alabama.** [Research Notes.] *J. Parasitology*. 1960, Apr., v. 46, No. 2, 230.

A nodule was noticed in the right breast of a woman in Atmore, Alabama. 3 weeks later the patient complained of intense itching and discomfort and stated that the nodule had moved some 2 inches from the initial site. Incision resulted in the emergence of a white pseudo-segmented worm measuring about 94 x 4 mm. In every significant respect it resembled published descriptions of larval pseudophyllidean cestodes. Specific identity could not be determined but the author, from the Communicable Disease Center, quotes FAUST and RUSSELL [this *Bulletin*, 1958, v. 55, 346] in the opinion that most or possibly all cases of non-proliferating sparganosis reported from that area of the United States may be classified as *Diphyllobothrium mansonoides*. The source of infection could not be determined, but it may have originated in shallow well water containing an infected copepod.

This seems to be the 4th case of sparganosis reported in man in the United States [see also *ibid.*, 1952, v. 49, 1059]. *H. J. O'D. Burke-Gaffney*

LUCKER, J. T. **A Test of the Resistance of *Taenia saginata* Eggs to Freezing.** [Research Notes.] *J. Parasitology*. 1960, June, v. 46, No. 3, 304.

The author, from the U.S. Department of Agriculture, working in Beltsville, Maryland, received some gravid proglottids and free eggs of *Taenia saginata*, from Dallas, Texas, after they had been some 2 days in transit; in Dallas they had been stored at 24°F. for about 4½ days.

From this material the author obtained some 900,000 brown-shelled eggs in 150 ml. of water. 3 aliquots were prepared; the first was given at once to a bovine animal and the other two were held at 24°F. for 12·3 and 76·1 days respectively, until a few hours before they were given to two bovine animals. The animals were killed 64, 117 and 60 days after administration of the eggs, and the degree of infection of the heart and muscles was determined. In the first group, infection was fairly heavy, in the second it was moderate and in the third only 2 cysts were found.

Evidently under these conditions a considerable proportion of *T. saginata* eggs withstood a temperature of 24°F. for nearly 2 weeks and a small proportion withstood such an exposure for nearly 11 weeks.

H. J. O'D. Burke-Gaffney

HAINING, R. B. & HAINING, R. G. **Cysticercosis Cerebri.** *J. Amer. Med. Ass.* 1960, Apr. 30, v. 172, No. 18, 2036–9. [12 refs.]

"A 48-year-old man died of cysticercosis cerebri. He survived surgical removal of a solitary cyst in the 4th ventricle for 2½ years.

"Preoperatively the diagnosis had been in serious doubt although, after the patient's hospital stay and performance of multiple tests, the consensus was 'intracranial neoplasm.' After ventriculography the diagnosis was 'posterior fossa tumor.' Even at this point none of us considered the possibility of cysticercosis cerebri. We should have done so."

HACIG, Alice, SOLOMON, Paula & WEINBACH, R. Recherches sérologiques sur l'hyménolépidose. L'étude d'un antigène d'*Hymenolepis diminuta* dans les réactions antigène-anticorps *in vivo* et *in vitro*. [**Serological Research in Hymenolepidosis. Study of an Antigen of** *Hymenolepis diminuta* **in Antigen-Antibody Reactions** *in vivo* **and** *in vitro*] *Arch. Roumaines Path. Expér. et Microbiol.* 1959, Dec., v. 18, No. 4, 610–25. [25 refs.]

The antigen was prepared from *Hymenolepis diminuta* taken from rats. The worms were ground up and 1 gm. of the paste was extracted with 10 ml. isotonic saline. 2 rabbits were immunized by 9 intravenous injections of antigen during 27 days.

For cutaneous reactions, 0·2 ml. of 1/10 dilution of antigen was injected intradermally into 6 children infected with *Hymenolepis*—all gave a positive reaction (slight in 4) one hour later, but in 2 of the children a control injection of saline caused a similar reaction. The 2 rabbits did not give a cutaneous reaction. One child infected with *Trichuris* gave a mild positive reaction and one child with *Giardia* and *Enterobius* a positive reaction both to antigen and to saline. (At 24 hours there were no reactions.)

When 0·2 ml. of serum to be tested was brought into contact with 0·2 ml. of diluted antigen, the sera of the 2 rabbits gave a positive precipitin (ring) reaction with 1/1,000 *Hymenolepis* antigen and 1/2,000 *Ascaris* antigen.

During complement-fixation tests it was found that the *Hymenolepis* antigen was positive in 1/8 dilution with the rabbit antisera, while the *Ascaris* antigen did not react at all.

If the *Hymenolepis* antigen was exposed to normal sodium hydroxide for 15–30 minutes at 56°C. it acquired a haemagglutinating power for sheep red cells.

By means of selective absorption with red cells of rabbit, cow or sheep according to the technique of Weinbach and Hass (*Studii si Cercetări Inframicrobial*, 1957, v. 8, 419) it was shown that the extract of *Hymenolepis* contained heterogenous antigen of the Forssman type. *F. Hawking*

MANDRAS, A., ADDIS, S. & PINTUS, L. Ricerche sulla diffusione dell'idatidosi nella popolazione rurale della Provincia di Sassari. [**Incidence of Hydatidosis in the Rural Population of the Province of Sassari**] *Igiene Moderna.* 1959, v. 52, Nos. 11/12, 713–24. English summary (8 lines).

The authors point out that Sardinia has one of the heaviest hydatidosis infection rates in the world; that in the 5 years 1951–56, 363 surgical operations

have been performed for this cause alone in just two surgical departments in Sassari province but that even these figures do not show the true incidence.

From January to September 1959 all the patients attending the out-patient clinic of the Agricultural Mutual Benefit Society at Sassari were screened for hydatidosis by the complement-fixation and haemagglutination tests, CF titres of more than 1 in 10 being considered positive. 1,922 patients aged between 8 and 85 years from various areas in the province were screened and the results were as follows. 24 were CF positive, 42 HA positive, 27 positive to both tests; total 93 positive (4·83%). 904 were males and 1,018 females. More positive results were found in persons over 45. In 1 area, 11 out of 127 persons were positive. Of the 93 positive for screening tests 81 were examined by the Casoni intradermal test, differential white cell count, and X-ray examination. 37 were Casoni positive and 25 had eosinophilia. 12 patients were or had been operated on for hydatidosis. 7 were suspect.

The authors conclude that the morbidity from hydatidosis among the rural population of Sardinia is much higher than even the most pessimistic hospital reports had led them to think. *W. K. Dunscombe*

NENOW, S. Wystepowanie bąblowców (*Echinococcus*) w Bułgarii. [**Occurrence of *Echinococcus* in Bulgaria**] *Wiadomości Parazytologiczne*. Warsaw. 1960, v. 6, No. 1, 31–40, 3 figs. [40 refs.]

The English summary appended to the paper is as follows:—

"The problem of *echinococcosis* in Bulgaria is discussed in the light of world literature. The percentages of dogs infected with Echinococci are: 16% in towns, and 40% in the country. The invasion happens frequently also in slaughter animals and was found in 66·5% of sheep, 40·8% of cattle and 4·42% of swine.

"Infections of man are not rare. In the years 1901–1959 a total of 5,617 cases was recorded, which means 350 [*sic*] cases yearly on the average. This concerns particularly rural population, whereby women more frequently become infected than men.

"The author also discusses the localization of the parasite in various organs of man, the more unique and interesting clinical cases, the mortality and other epidemiological data. This is a summing up of a number of papers and publications which on this subject appeared in the Bulgarian literature."

AGOSÍN, M. Bioquímica de *Echinococcus granulosus*. [**Biochemical Aspects of *Echinococcus granulosus***] *Biológica*. Santiago. 1959, July–Dec., Nos. 27/28, 3–32, 16 figs. [Numerous refs.] English summary.

SANI, A. Cisti da echinococco e tubercolosi polmonare contributo casistico. [**Echinococcal Cysts and Pulmonary Tuberculosis**] *Lotta c. la Tubercolosi*. 1959, Dec., v. 29, No. 12, 1733–51. [Numerous refs.]

An account of 17 cases.

HITCH, J. M. & IRALU, V. **Studies relating to Creeping Eruption.** *Southern Med. J.* 1960, Apr., v. 53, No. 4, 447–53, 2 figs. [13 refs.]

Creeping eruption due to infection with *Ancylostoma braziliense* and *A. caninum* is common in Florida and other southern States of the U.S.A. Negroes seem to have a partial immunity. In the present work a study was made of substances which can kill the larvae of *A. caninum*. The larvae were placed in a well-slide with concentrations of the compound, ranging from 0·05 to 0·005%. 157 compounds were examined, and most of them failed to kill the larvae within 12 hours. However, iodine, pyridine, 4-N-hexylresorcinol and 4-iso-hexylresorcinol killed in 1 hour and iodoacetate, 4-N-decylresorcinol, 4-heptylresorcinol and 4-octylresorcinol killed in 12 hours. During *in vivo* tests with mice, neoarsphenamine, fuadin and a bismuth-arsonate compound were inactive.

The larvae were not killed by freezing and any therapeutic effect produced by the time-honoured freezing treatment must be due to the blistering and exfoliation and not to the low temperature. The larvae were killed by heating to 48°C. for 15 minutes but not by 46°C. for 22 minutes. In 2 patients with creeping eruption on the foot, immersion in hot water at 48°C. for 15 minutes failed to kill the larvae, probably because the circulation carries the heat away; this temperature is not damaging to the skin but it is as high as the patient can endure. The larvae were not killed by moderate doses of X-ray. When the larvae were placed in the sera of infected dogs, precipitates were formed around them. *F. Hawking*

i. GHYSELS, G. & SARTIAUX, P. Le traitement de l'ankylostomiase par l'hydroxynaphtoate de béphénium. [**Treatment of Ankylostomiasis with Bephenium Hydroxynaphthoate**] *Ann. Soc. Belge de Méd. Trop.* 1959, Oct. 31, v. 39, No. 5, 637–42.

ii. NINANE, G. & POFFE, F. Essai clinique de l'hydroxynaphtoate de béphénium dans l'ankylostomiase. [**Clinical Trials of Bephenium Hydroxynaphthoate in Ankylostomiasis**] *Ibid.*, 1959, Dec. 31, v. 39, No. 6, 887–92.

These two studies were made in the Belgian Congo (Léopoldville and Stanleyville respectively) and were carried out on very similar lines.

i. In this study, the authors used 5 gm. Alcopar (= 2·5 gm. bephenium base). 60 patients aged 10 months to 40 years were treated. About half received one dose and half 2 doses on the same day. Children less than one year received half a dose and this was also given to some older children who had difficulty in taking the drug. Egg counts and enrichment were done 1, 2 and 4 weeks after treatment. The worms were mostly *Necator* which is the predominant hookworm in Léopoldville [this *Bulletin*, 1932, v. 29, 754.]

The results are tabulated and the reductions in egg counts are recorded. 37 persons [62%] were negative at the third examination. A single dose seemed to be as effective as 2 doses. The results are compared with those of GOODWIN *et al.* [*ibid.*, 1959, v. 56, 639] in which 3 doses of 2 gm. of base were given and were strikingly similar.

No alterations in blood counts or liver function tests were noted. A few children vomited when taking the drug and 10 patients had a light transient diarrhoea.

No special preparation of the patients was made other than a fat-free diet.

ii. In the Stanleyville study 25 children aged 1 to 8 years and 25 adults were given respectively 2·5 gm. and 5 gm. of the base in a single dose. Stools were examined by enrichment and egg counts after 4 and 6 days.

10 children were completely deparasitized and in 9 others the egg counts were negligible, although the enrichment method was positive. In 6 both methods were positive, but the egg counts were considerably reduced in most of them. 2 children vomited and 4 had light transient diarrhoea.

13 of the adults on the double dose became completely negative: in 8 enrichment only was positive. 5 remained positive, but with reduced egg counts. 5 patients had some diarrhoea.

The authors point out that in light infections, egg counts are not reliable, as a negative count merely indicates that there are less than 200 eggs per cc. of stool. When those patients only are considered who had at least 1,000 eggs per cc. initially, the authors estimate that 70–75% were freed of parasites and that the results are comparable with those of GOODWIN *et al.* [*loc. cit.*].

They consider that the increased therapeutic effect of a double dose is too slight to justify its use and that a single dose of 2·5 gm. bephenium base is indicated in mass treatment. *H. J. O'D. Burke-Gaffney*

ADAMSON, P. B. **Strongyloidiasis in Durban.** *South African Med. J.* 1960, May 7, v. 34, No. 19, 383–5. [22 refs.]

Strongyloidiasis is a common condition in Durban, infection is often intense and in malnourished subjects a definite mortality is attributable to it [presumably due to massive pulmonary invasion by the larvae].

The author in a small series of patients, both white and coloured, carried out a clinical trial of 4 drugs, dithiazanine (Telmid or Partel), oral gentian violet, hexylresorcinol and potassium thiocyanate. The last drug was used as an experiment based on the known high oxygen requirements of strongyloid larvae: the author hoped that by its general diffusion throughout the body fluids it would selectively depress the metabolism of strongyloid larvae and thus kill them in their tissue phase.

The results were assessed at least 1 month after completion of treatment, which was considered to have been successful if at least 6 stool examinations by a concentration method failed to reveal larvae. The relative efficiency of the various drugs can be appreciated from a table:

	Apparently cured	*Failed*	*Total*
dithiazanine	8	1	9
gentian violet orally..	1	3	4
hexylresorcinol	0	3	3
thiocyanate	2	4	6

The dosage of potassium thiocyanate is not stated but blood levels as high as 10 mgm. per 100 ml. were obtained—and maintained for as long as 21 days—without success.

[The reputation of dithiazanine is sustained.] *J. H. Walters*

ZDZIENICKI, S. & NOWOSIELSKI, T. Jaja pasożytów przewodu pokarmowego na jarzynach z rynku warszawskiego. **[Eggs of Parasites of the Alimentary Tract in Vegetables from the Warsaw Market]** *Wiadomości Parazytologiczne.* Warsaw. 1960, v. 6, No. 1, 67–9.

The English summary appended to the paper is as follows:—

"Continuing their previous investigations (*Wiad. Paraz.*, 1958, v. 4, 537) the authors examined 100 bunches of radish and 40 samples of cabbage-lettuce bought in the shops of Warsaw (from April till June 1959). They found parasite eggs in 93% of the radish bunches and 47·5% of cabbage-lettuce. These were chiefly eggs of *Ascaris,* further—*Trichuris* and *Oxyuris.*

"Such a considerable contamination of the vegetables is to be explained by the use of human excrement for dunging."

GERBASIO, A. E. & VINGIANI, A. Ricerche elettroforetiche sulle modificazioni del protidoplasma nell'ascaridiosi. **[Electrophoretic Investigations of Plasma Protein Changes in Ascariasis]** *Acta Med. Italica.* 1959, Apr., v. 14, No. 4, 99–101.

Using electrophoretic techniques, the authors have investigated the serum proteins in the blood of 12 children, aged 6 to 9 years, with ascariasis: there was nothing in the history of these subjects to suggest any conditions which may in any way have affected the liver or its function. The total proteins were below 6 gm.%, the serum globulins were slightly increased and the A/G ratio reduced, and there was positive evidence of colloidal instability in 3 of the children. 5 other children also showed some colloidal instability. All the findings were negative in the other 4 children of the series.

The authors attribute the changes to nutritional factors—a reduced intake due to loss of appetite and condition, and interference with the absorption of the food due to changes of the intestinal wall, impaired secretion of the digestive juices and a faster passage through the intestinal tract. Some damage to the liver by direct or indirect action of the parasite cannot be excluded.

J. Cauchi

SHANKER, A. & GULATI, J. **Purpura after Administration of Piperazine.** [Memoranda.] *Brit. Med. J.* 1960, May 28, 1622.

Piperazine has been widely accepted as the anthelmintic of choice in ascariasis and enterobiasis, and is considered to be non-toxic. This report of the occurrence of severe anaphylactoid purpura following its use [though it appeared to be the first occasion on which the patient had encountered the drug, and a latent period of 8 days elapsed before the onset of symptoms] is of interest.

An Indian girl aged 10 years was admitted to hospital in Bhopal with bleeding from the nasal mucous membrane, from the gums and from the renal tract, while the body was covered with discrete purpuric spots. There was a moderate anaemia (erythrocytes 3,400,000 per cmm., Hb 62%), the leucocyte count was within the normal range, and the platelet count (135,000 per cmm.) was not

significantly depressed. Hiss's capillary test was positive. Bleeding time and coagulation time, also prothrombin concentration, were normal.

She had received 4·8 gm. of piperazine citrate for suspected ascariasis, in a single dose, 8 days previously.

Ultimate recovery was complete, the bleeding tendency having subsided by the 10th day after its appearance. [The attribution to piperazine of this attack of "allergic" purpura may be an unjustified assumption. No further test of sensitivity was performed.] *J. H. Walters*

ROGERS, W. P. **The Physiology of Infective Processes of Nematode Parasites; the Stimulus from the Animal Host.** *Proc. Roy. Soc.* Ser. B. 1960, June 14, v. 152, No. 948, 367–86, 11 figs. [44 refs.]

VAUGHN, J. & JORDAN, R. **Intestinal Nematodes in Well-Cared-For Dogs.** *Amer. J. Trop. Med. & Hyg.* 1960, Jan., v. 9, No. 1, 29–31, 1 fig. [14 refs.]

The authors collected dog faeces found on lawns or footpaths in the New Orleans area or obtained them from dogs brought to veterinary hospitals in the city. Of the stools in Group 1 found on lawns or footpaths, 170 were examined by direct smear or $ZnSO_4$ centrifugal flotation and egg counts were made on standard direct smears containing 1 mgm. of faeces [see BEAVER, this *Bulletin*, 1951, v. 48, 652]. Of the stools obtained from hospitals 325 were examined by direct smear, $ZnSO_4$ flotation and formalin-ether sedimentation. All hookworm eggs were presumed to be those of *Ancylostoma caninum*, because no other species of hookworm has been found by autopsy of dogs in the area investigated.

Table 1 shows the results. In Group 1 *Toxocara* was found in about 8% of the stools, "whipworm" in 16% and hookworm in 52%. In this group none of the *Toxocara* or *Trichuris* infections produced more than 20,000 eggs per gm. of faeces and two-thirds of them gave less than 5,000 e.p.g. Half the hookworm infections were light (less than 5,000 e.p.g.) and half moderate or heavy (over 20,000 e.p.g.).

In Group 2, in which sex and age distribution could be investigated, *Toxocara* was found in 6%, *Trichuris* in 19% and hookworm in 46%. In this Group *Toxocara* was markedly more prevalent in younger dogs (15% in dogs under 9 months old and 3% in mature dogs); but *Trichuris* was commoner in older dogs (7% in young and 24% in older dogs). Hookworm was found in about half the dogs in both groups, the percentages in dogs in hospitals being 41·7% in young and 47·3% in older dogs. In Group 2 two-thirds of the *Toxocara* infections were light and one-third moderate. There was 1 heavy infection with *Trichuris*, but half the others were light and half moderate. There were 2 heavy infections with hookworm, but two-thirds of the rest were light and one-third moderate. No significant differences could be shown in the 3 infections in relation to the sex of the host and there were only slight differences in dogs confined to the house (except for exercise) and those set free in the yard or the open.

HINMAN and BAKER [*J. Trop. Med. & Hyg.*, 1936, v. 39, 101; this *Bulletin*, 1936, v. 33 (951)] autopsied over 1,000 dogs in the New Orleans area and found

Toxocara in about 2%, *Trichuris* in 57% and hookworm in 42%. The authors conclude that, as these percentages do not differ markedly from their own, protection given to pet dogs does not control *Toxocara* and hookworm infections and probably has little influence on *Trichuris* infections. Dogs probably acquire infections when they are allowed out on leash or free.

The possibility of transmission of helminths of dogs to children is discussed with references to some of the literature on this subject. Children can become infected even when they have had no known contact with dogs, as is shown by the case reported by MILBURN and ERNST (*Pediatrics*, 1953, v. 11, 358), in which the liver was invaded by nematode larvae. *G. Lapage*

DENT, J. H. **Visceral Larva Migrans.** *Southern Med. J.* 1960, May, v. 53, No. 5, 616–20. [20 refs.] Discussion 620–21.

A general account and review of the literature.

VAN THIEL, P. H. Larva migrans visceralis. **[Larva Migrans Visceralis]** *Nederl. Tijdschr. v. Geneesk.* 1960, June 4, v. 104, No. 23, 1104–7, 1 fig. [17 refs.]

The English summary appended to the paper is as follows:—

"De Vries described the unexplained clinical picture of a child suffering from encephalitis, in whom a nematode larva was found in the brain. This has now been recognized as probably a case of larva migrans visceralis caused by the larva of *Toxocara* from a dog or cat. Unlike the two other cases observed in the Netherlands, it has been possible in this case to identify the larva. The syndrome of hyper-leukocytosis, eosinophilia and hepatomegalia has been named larval granulomatosis, after Karpinski and his associates." [See this *Bulletin*, 1956, v. 53, 1457.]

KREIS, H. A. Parasitische Würmer aus südamerikanischen Haustieren (Beiträge zur Kenntnis parasitischer Nematoden. XXII). **[Parasitic Worms from South American Domestic Animals]** *Ztschr. f. Parasitenk.* 1960, v. 20, No. 1, 23–134, 34 figs. [172 refs.]

HUSSON, R. A. & SCHNEIDER, J. La réaction de fixation du complément dans le diagnostic des filarioses. **[The Complement-Fixation Test in the Diagnosis of Filariasis]** *Bull. Soc. Path. Exot.* 1958, Nov.–Dec., v. 51, No. 6, 960–67.

Experience shows that the complement-fixation reaction in filariasis is not specific and antigens made from this group of worms give similar results. Alcoholic extracts were made from *Dracunculus medinensis, Dirofilaria immitis, Litomosoides carinii* and *Dipetalonema vite*. These antigens were tested against the sera of 77 patients in whom the diagnosis of filariasis was suspected. [The tests are described in detail, and one of the authors has informed the reviewer that in most the 4 antigens were employed singly and successively, and that

later tests were made with mixed antigens but no significant variation was found.]

In 45 patients the complement-fixation reaction was positive:—in 35 patients with *Loa loa* infection 33 of whom presented some clinical signs, and 2 in whom the signs were unmistakable. Of these 35 patients, the microfilariae of *L. loa* were found in 18, and those of *L. loa* and *D. perstans* occurred together in 3. In 4 others, those of *D. perstans* occurred alone. In the 10 remaining, no microfilariae were found, but in all but one the intradermal reaction was positive.

In the 10 other patients with a positive complement-fixation reaction, 5 were suspected of being infected with *Wuchereria bancrofti* because of elephantiasis, chylous hydrocele and chyluria. In 4 the intradermal reaction was positive, and doubtful in the other. In 4 patients in whom the diagnosis of onchocerciasis was made, microfilariae were found in 2 by skin snips and in the 2 others the intradermal reaction was positive. In the remaining patient, infection with *W. malayi* was suspected and the intradermal reaction was positive though no microfilariae were found.

In 32 suspected cases of filariasis, the reaction was negative. (a) In infections with *L. loa*: 8 cases were diagnosed clinically. In 2, the microfilariae of *L. loa* were found in the blood, in 2 others they occurred with those of *D. perstans*, and in another patient those of *D. perstans* occurred alone. In the other 3, intradermal reactions were positive. (b) In infections with *D. perstans*: in 3 patients with no clinical signs but with numerous microfilariae of *D. perstans* in the blood and an eosinophilia, the complement-fixation reaction was negative. (c) In infections with *W. bancrofti*: in 2 suspected cases the reaction was negative; one suffered from elephantiasis, chylous hydrocele and eosinophilia and had a positive intradermal reaction.

In 11 cases, no clinical signs of infection were found. 2 of them had a positive intradermal reaction and 3 a raised eosinophilia. 5 cases of infection with *L. loa* were treated and were followed up for 2-10 years after treatment. The microfilariae disappeared, the eosinophilia returned to normal, and the complement-fixation reaction was negative. 3 subjects, from an area endemic for infection with *L. loa*, who presented no clinical signs and in whose blood no microfilariae were found, and in whom the intradermal reaction remained negative, had negative complement-fixation reactions.

It is concluded that the complement-fixation reaction cannot in any way be compared in the diagnosis of filariasis with the identification of adult worms or microfilariae or even with the intradermal reaction. It may, however, be useful in confirming clinical cases where other means are not available.

W. E. Kershaw

EDESON, J. F. B., WILSON, T., WHARTON, R. H. & LAING, A. B. G. **Experimental Transmission of *Brugia malayi* and *B. pahangi* to Man.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1960, May, v. 54, No. 3, 229–34, 6 figs. (4 on 2 pls.) [10 refs.]

"1) An attempt was made to transmit back to man a strain of *Brugia malayi* originally obtained from man and transmitted through a macaque monkey and thence to a cat. Two volunteers were inoculated with infective

larvae of this strain which had developed in *Mansonia longipalpis*. Neither of these volunteers subsequently developed microfilariae.

"2) An attempt was also made to transmit to man a strain of *B. pahangi*, a species hitherto only known as an infection of animals. Two volunteers were inoculated with infective larvae from *Armigeres obturbans* which had fed on a cat carrying a strain of *B. pahangi* originally obtained from a naturally infected civet cat.

"3) One of the volunteers inoculated with *B. pahangi* developed microfilariae 84 days later, and these persisted in small numbers for a further 56 days. The microfilariae resembled *B. pahangi* morphologically, and the identification was confirmed by mosquito-feeding experiments and by experimental transmission to a cat from which an adult male *B. pahangi* was later recovered. The other volunteer did not develop microfilariae.

"4) All four volunteers suffered from episodes of lymphangitis, lymphadenitis, and oedema in the inoculated limb, starting in each instance about one month after the inoculation.

"5) Although there was no true leucocytosis, all four volunteers developed a relative increase in eosinophils with maxima ranging from 18 to 32% occurring 12 to 13 weeks after the inoculation.

"6) All volunteers showed positive complement-fixation tests and skin tests (to *Dirofilaria* antigen) about 12 weeks after the inoculation.

"7) One volunteer from each pair developed subcutaneous nodules in the inoculated arm about 4 months afterwards.

"8) The significance of these findings is discussed. *B. pahangi* must now be regarded as potentially infective to man. The clinical episodes are considered to be reactions to the immature developing worms, whereas the eosinophilia is more probably a response to some product of the adult worms. Subcutaneous nodules do not seem to have been described previously in association with filarial infection."

NAIR, C. P. **Problems connected with Filariasis Control in India.** *Kerala State Qualified San. & Health Inspectors' (other than Govt. Servants) Ass. Souvenir.* First Provincial Conference, Calicut, 8 & 9 December 1959. pp. 53–5, 1 fig. on pl. 1960.

Filariasis is prevalent throughout India, except in the States of Jammu and Kashmir, Himachal Pradesh and Rajasthan. *Wuchereria bancrofti* prevails throughout, but in Kerala *W. malayi* is widely distributed also; in that State *W. bancrofti* largely prevails in areas north of Ponani, while *W. malayi* is prominent in the coastal belt south of Ponani (except in congested towns, where *W. bancrofti* predominates). The rural *W. malayi* is associated with heavy breeding of *Mansonia* in water infested with *Pistia*.

Filariasis creates a very considerable social and economic problem in India. In 1949 the Indian Council of Medical Research sponsored a pilot project in Orissa to evaluate control methods and in 1952 a filariasis section was established in the Malaria Institute of India. In 1955, by agreement between the Government of India and the Government of the United States of America, a national filaria control programme was established and field survey and control units were set up in each Indian State. There are now 22 survey and 46

control units: 39 of the latter are already operating. In addition, a filariasis training centre has been provided in Ernakulam (from which the author writes) and 70 medical officers and 109 filaria inspectors have already taken the course of training. The centre also functions as a regional centre for States in the south.

The function of control units is to take measures against the parasite (mass diethylcarbamazine, 200 mgm. daily for 5 days) and against the vectors. BHC is used as a larvicide and dieldrin as an imagocide (one round of spraying at the peak season in urban areas and 3 rounds in rural areas). Each control unit covers a population of about 300,000 people. There are 2 survey units and 6 full control units in Kerala.

It has been estimated that in India 36 million people are exposed to *W. bancrofti* infection and 4 million to *W. malayi*. By October 1959 2 million people had received diethylcarbamazine and the houses of some 7 million had been sprayed. Preliminary studies on the use of chlorinated hydrocarbons against *Mansonioides* have been promising.

Certain difficulties are discussed. BHC has not proved satisfactory as a larvicide and unfortified oil is being introduced in its place. Resistance of *Culex fatigans* to dieldrin has necessitated the introduction of a high gamma BHC for residual spraying. Much more importance is attached to long-term measures, such as improving environmental sanitation, especially by drainage.

Side effects and specious rumours regarding the use and results of diethylcarbamazine prophylaxis have hampered the campaign, and health education by all available means is being undertaken. The author points out that for the success of these measures "all the public health workers engaged in this difficult task of filaria control must have sufficient imagination, patience, diplomacy and sincerity" and the active cooperation of the community must be total. *H. J. O'D. Burke-Gaffney*

DUKE, B. O. L. **Studies on Loiasis in Monkeys. II. The Population Dynamics of the Microfilariae of *Loa* in Experimentally Infected Drills (*Mandrillus leucophaeus*).** *Ann. Trop. Med. & Parasit.* 1960, Apr., v. 54, No. 1, 15–31, 8 figs.

10 drills were inoculated with infective larvae of the human diurnal type of *Loa loa* and microfilariae were found in the blood after an average period of 159 (145–172) days. 7 drills were similarly inoculated with larvae of the simian nocturnal *Loa* and microfilariae were found in the blood after an average period of 144 (138–153) days. For comparison, 4 drills were given gravid adult female worms of human *Loa* by transplantation and microfilariae were found in the blood after 13–36 (average 21) days, and 6 drills were given simian adults and microfilariae were found in the blood after 15–30 (average 23) days. Microfilariae could be found in the lymph glands draining the areas where adult worms were situated (and also in the lungs) during the prepatent period and also during other later periods when microfilariae were absent or rare in peripheral blood. Hence it is believed that the microfilariae pass from the adult worms (lying in subcutaneous tissue) through the lymph glands before they reach the circulating blood. 2 drills were killed 9 and 15 days after adult worms had been implanted and before microfilariae could be found in the

circulating blood during life. At post-mortem examination many microfilariae were found in the blood of the left pulmonary vein (and fewer in the right ventricle), showing that during this prepatent period there had been a great accumulation of microfilariae in the lungs.

The typical course of a primary infection with *Loa* in these drills was the same whether the infection was produced by infective larvae or by the inoculation of adult worms. When the microfilariae appeared in the blood they increased in numbers to a peak value (usually between the 9th and 12th weeks) and then diminished rapidly during the next 3–6 weeks. After that scanty microfilariae persisted as long as gravid worms remained alive; this chronic stage is named a "suppressed" infection. When monkeys having a "suppressed" infection were killed, a great number of microfilariae were found in the lungs, showing that the adult females were still producing many microfilariae and that the "suppression" was due to destruction of the microfilariae after they reach the blood. If the spleen was removed during this stage of suppression, the number of microfilariae in the blood rapidly increased and it remained high indefinitely (more than 11 months). Similarly, if the spleen was removed before a monkey was inoculated with infective larvae, the microfilarial count rose steadily and then continued on a high plateau for a long period. This shows that in these monkeys the suppression of the microfilarial count was due to their destruction in the spleen. (Splenectomy produced no change in the periodicity of the microfilariae.) If fresh adult worms were implanted into a monkey during the suppressed stage of the infection, the microfilarial count was not appreciably increased (because the new microfilariae were rapidly destroyed by the spleen). Similarly, if drills with suppressed infections were inoculated with infective larvae on several occasions, only very small increases of the microfilarial counts appeared after the appropriate prepatent period; but when such monkeys were eventually killed, 40–50 fecund female worms could be found. This state of immunity to reinfection extended also to the heterologous strains of *Loa*, *i.e.*, infection with the diurnal strain prevented the survival of microfilariae of the nocturnal strain when female worms were implanted, and conversely.

From all this work, it is concluded that when microfilariae are first liberated from the adult worms they pass (probably *via* the lymphatics) to the blood and they accumulate in the capillaries of the lungs before invading the peripheral circulation. A reservoir of microfilariae is maintained in the lungs throughout the whole infection. Only a proportion of the microfilariae present in the lungs (possibly only those which have reached a certain age) exhibit periodicity and invade the peripheral blood. After a time (about 9–12 weeks) the spleen destroys most of the microfilariae which are in the circulating blood, although the female worms continue to produce microfilariae which are still stored in the lungs. If the spleen is removed the number of microfilariae in the blood increases until a balance is reached between the number produced and the number which die. At this stage, the number in the blood seems to be proportional to the number of female worms present and the microfilariae appear to live about 6–12 months.

[This paper describes much valuable fundamental work about filarial infections and it should be studied in the original by all who are interested in this subject. Work in the reviewer's laboratory on the other filarial infections (*Dirofilaria*, *Litomosoides* and *Dipetalonema*) indicates that the same phenomena

(*e.g.*, effect of splenectomy on the microfilaria count) can be observed in them also but to a less marked extent. *Loa* is probably less perfectly adapted to its vertebrate hosts than many other filarial worms, and therefore the immune reactions to it are more clearly marked than are those to the others.]

[For Part I, see this *Bulletin*, 1959, v. 56, 197.] *F. Hawking*

JUNG, R. C. & HARRIS, F. H. **Human Filarial Infection in Louisiana.** *Arch. Pathology*. 1960, Apr., v. 69, No. 4, 371–3, 1 fig.

The authors record what they think is the first case of filarial subcutaneous nodules in man in Louisiana, although cases have been reported from Florida. The limitation of these cases to the south-eastern States suggests that the causative agent is restricted to this area, though its geographical distribution may be due to chance.

The infected man was a white, aged 28, who had never been out of southern Louisiana except for Army service in Texas (2 years) and short visits to Mexico City. He had developed, 3 weeks previously, soreness and a painful nodule on the medial side of his right arm just above the elbow and red streaks running up the arm. The symptoms disappeared a week after treatment with penicillin, but, when he was back at manual work and taking oral penicillin, the swelling and redness returned, but subsided, leaving a small, tender subcutaneous nodule on the extensor surface of his forearm. Routine health examinations gave normal results.

The nodule, which measured 2·5 × 2 × 1·3 cm., was removed. Most of it was fat, but a section of its firmer central zone (about one-third of the nodule) showed that it consisted of normal fibrofatty tissue intensely infiltrated with lymphocytes and neutrophils, around which was marked fibroplastic proliferation. In this part of the nodule were sections of a worm, with necrotic material around them containing very large numbers of neutrophils, many fragmented and with pyknotic nuclei, and outside this necrotic material were endothelial cells and a few multinucleate giant cells. Dr. Paul BEAVER to whom the sections were referred, considered that the worm was a degenerating *Dirofilaria* similar to *D. conjunctivae*.

A month later the patient was negative to haemagglutination and complement-fixation tests for *Dirofilaria* antibodies. He kept dogs, and the blood of these contained microfilariae of *Dipetalonema*, but the patient's blood did not.

The authors cite literature about the 39 known cases of human infection with *Dirofilaria*. Of these, 6 were in the U.S.A., 5 being from Florida (all superficial lesions) and 1 from New Orleans (an adult *Dirofilaria* in the vena cava). In the Mediterranean and Near East the infection may be with *Dirofilaria repens*, a common subcutaneous parasite of dogs in those areas, but this has not been found in the U.S.A. The authors think that this patient may have been infected with *Dirofilaria immitis*, but other species suspected of causing this particular infection are *Dirofilaria tenuis*, found in raccoons in southern Louisiana, which abounded round the patient's home, and the patient was fond of hunting them; *D. scapiceps* of rabbits, also found near the patient's home; and *D. spinosa* and *D. subcutanea* of porcupines, though porcupines do not occur near the patient's home. Infection with the species of *Dirofilaria* in the patient's dogs

was also possible. Further studies on the commoner filariae and other types of worms are needed. *G. Lapage*

ROHDE, K. Testierungsmethode von Filarien-Präparaten an mit *Litomosoides carinii* infizierten weissen Ratten. [**Screening Methods for antifilarial Compounds with the Use of White Rats infected with** *Litomosoides carinii*] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1959, Dec., v. 10, No. 4, 385–401, 4 figs. [15 refs.]

In a previous preliminary publication ROHDE [this *Bulletin*, 1959, v. 56, 961] had reported successful infections of white rats with *Litomosoides carinii*, but attempts to infect *Meriones* and *Mastomys* had failed. For the technical details of passing the infection from cotton-rats *via Bdellonyssus bacoti* to white rats, the original should be consulted. The size of the adult male and female worms in white rats was as great as it is in cotton-rats. The author infected about 71% of 290 rats, but 85 rats failed to become infected, probably because the infection in the mites was too light. Worms were found in the left pleural cavity more often than in the right one.

The rats were used for chemotherapeutic tests. Diethylcarbamazine gave the usual results [see *ibid.*, 1950, v. 47, 1019], removing almost all the microfilariae from the blood but having little effect on the adult worms. Solustibosan in high dosage killed the adult worms. About 2–3 weeks after infection the white rats showed an eosinophilia of 2% which later rose to 7%; but this is too inconstant to be used for diagnosis.

[This paper contains various technical details which will interest those who are maintaining infections of *L. carinii* in their laboratories. Other workers have usually found that white rats were less satisfactory than cotton-rats as hosts for this infection.] *F. Hawking*

See also p. 957, LEWIS, **The** *Simulium neavei* **Roubaud Complex (Diptera: Simuliidae) at Amani in Tanganyika.**

NENOW, S. O swoistości próby mikroprecypitacyjnej z żywymi larwami przy włośnicy. [**On the Specificity of the Microprecipitation Test with Live Larvae, in Trichinellosis**] *Wiadomiści Parazytologiczne.* Warsaw. 1960, v. 6, No. 1, 21–5.

The English summary appended to the paper is as follows:—

"The author performed the microprecipitation test according to Roth, with use of larvae of *Trichinella spiralis.* To this test were submitted: 1) 335 healthy persons, 2) 580 persons affected with various diseases (table II) but not suffering from *trichinellosis,* and 3) 262 swine not infected with *Trichinella spiralis.* The percentages of positive results obtained in these groups were: 19·40% for the first group, 30% for the second and 26·72% for the third group. This is rather to be considered disadvantageous when evaluating the specificity of the test."

DEFICIENCY DISEASES

MONTALTO, F. A. **Aspectos fundamentales del problema de la nutrición en el Paraguay.** [Nutrition in Paraguay.]

This book was reviewed on p. 863.

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS. **FAO Nutrition Meetings Report Series No. 24. Report of the Nutrition Committee for the Middle East. First Session, Cairo, 18–26 November 1958.** Sponsored jointly by FAO and WHO. pp. vi + 55. Rome: 1959. [Sales agent for U.K., H.M. Stationery Office.] [$0.50 ; 2s. 6d.]

Regional Nutrition Committees of FAO have been well established in South East Asia and Latin America for many years. The first meeting of the Middle East Committee was held in Cairo in November 1958. This report of their deliberations covers the following subjects:— the study of food consumption; education in nutrition; the training of nutrition workers; the development of national nutrition services and the formulation of national nutrition policies. Each chapter ends with a list of recommendations. These are, for the most part, sensible and workmanlike, being well within practical possibilities even for countries with small budgets. It is to be hoped that this report will be carefully read in Government departments of the countries of the Middle East and that activities will follow.

The Committee can be congratulated for the manner in which they have started on their important task. *R. Passmore*

SADIKARIO, A. [**Manifestations in the Skin and Mucous Membranes in Kwashiorkor**] *Acta Fakultatis Med. Skopiensis.* Skopje. 1959, v. 5, 113–21, 3 figs. [17 refs.] [In Macedonian.] French summary.

The author has listed the lesions of the skin and mucous membrane observed in 101 children suffering from kwashiorkor [the locality is not stated]. Desquamation was observed in 62 children, hyperkeratosis in 6, mosaic skin in 12, pemphigoid in 6, pigmentation in 3, depigmentation in 6, erosions in 15, ulcers in 1 and bullae in 2. 36 children showed various types of subcutaneous haemorrhage, including petechiae (24) and ecchymoses (8 cases). 32 children were suffering from pellagra. Other manifestations observed included erythema (gluteal, scrotal, perineal, periorbital and circumoral), rhagades (ears, nose, external genitalia), affections of mucous membranes (stomatitis, blepharitis, vulvitis), disorders of the hair (change of colour, alopecia), keratomalacia (20 cases) and infections of the skin. *D. J. Bauer*

SADIKARIO, A. [**Cardiovascular and Electrocardiographic Changes in Kwashiorkor**] *Acta Fakultatis Med. Skopiensis.* Skopje. 1959, v. 5, 107–11, 4 figs. [In Macedonian.] French summary.

In an examination of the cardiovascular system in 101 children suffering from kwashiorkor bradycardia was found in 5, low blood pressure in 19 (of 22

examined), and weakened heart sounds. The electrocardiogram was recorded in 30 children; the P-Q interval was prolonged in 2 and the voltage of the QRS complex was reduced in 17. Abnormalities of the T wave were frequent, including reduced voltage (9 cases), flattening (7), inversion (2), bifid (3) and diphasic (3 cases).

[See also this *Bulletin*, 1960, v. 57, 627.] *D. J. Bauer*

PIBURN, M. F. **Kwashiorkor—Treatment with Cortisone and Diamox.** *Central African J. of Med.* 1960, Apr., v. 6, No. 4, 149–52, 4 figs.

Piburn decided to add to the conventional dietary treatment of the kwashiorkor syndrome (a) cortisone, on account of its stimulating effect on appetite and protein metabolism, and (b) Diamox since it is held to produce a water diuresis without depletion of electrolytes.

13 consecutive African children admitted to hospital in S. Rhodesia with this syndrome were placed on a somewhat elaborate regime, which is summarized below:—

(i) Darrow's electrolyte solution [containing potassium] by mouth;

(ii) skimmed milk with Caselin, *ad. lib.*, every 2–3 hours, from the second day of treatment;

(iii) cortisone acetate tablets, 12·5 mgm., every 4 hours from the second day: this dose was reduced if oedema increased but was not withdrawn until oedema had dispersed;

(iv) Diamox 62·5–125 mgm. daily, with reduction as oedema subsided;

(v) sulphaguanidine or guanamycin, to combat diarrhoea;

(vi) penicillin to combat infection, given for 1–2 weeks;

(vii) eggs, meat, vegetables and fruit as soon as the patients would take them.

There is no clear statement as to the individual progress of each patient—"While several cases responded quite well and rapidly, there were others that had a definite increase in their oedema and a persistence of the oedema for some 1 to 2 weeks (a few longer)". [In the case of 3 out of 4 children who appear in the first and last of 4 serial photographs, a marked increase in oedema appears to have occurred during the first 10 days of treatment.] The increase in oedema was not associated with a loss of appetite and so did not give rise to alarm. In one instance, however, oedema persisted for 4 weeks, and as it cleared signs of broncho-pneumonia with low fever appeared. This child, though gravely ill, eventually recovered.

The author maintains that Diamox exerted no adverse effects but is guarded in his assessment of the value of cortisone.

[This paper is based on clinical impressions only, and includes no numerical data on which the effects of treatment can be independently judged. In view of the magnitude of the problem of protein malnutrition in those parts of the world which have least financial and technical resources, the abstracter is critical of any modification of well established lines of dietary treatment which implies added expense and more nursing care.] *J. H. Walters*

HAEMATOLOGY

CHARMOT, G., REYNAUD, R. & RIGAUD, J. L. Le fer et sa pathologie. Intérêt en médecine tropicale. [**Iron and its Pathology. Relevance to Tropical Medicine**] *Méd. Trop.* Marseilles. 1960, Jan.–Feb. & Mar.–Apr., v. 20, Nos. 1 & 2, 32–40; 165–79. [27 refs.]

This review deals with the iron of the human body in health and disease. The human body contains about 4·5 gm. of iron, almost all of it in combination with protein. The element is subdivided into haem and non-haem iron. In the haem iron which amount to 70–75% of the total one atom of divalent iron is placed in the middle of a ring formed by four pyrroles. The synthesis of haem takes place in the bone marrow, and glycine and acetic acid are involved. Most of the haem iron (3 gm.) is in the form of haemoglobin. The remainder is nearly all in myoglobin and only less than 1% is found in cytochrome, the catalases and the peroxidases. The non-haem iron is found both in plasma and in the tissues. In adult man the normal plasma iron level is about 130 μgm./100 ml., and in the adult woman 120 μgm./100 ml. In the tissues iron is combined with apoferritin, with which it combines to form ferritin. Another form of tissue iron is haemosiderin. The principal iron reserve is in the liver. This organ contains, per kgm., 1·8 gm. of iron at birth, 0·35 gm. at the age of 1 year, and 1 gm. in the adult.

The diseases involving abnormalities of iron metabolism may either be due to an inability to combine inorganic iron with protein, to an inborn error in the formation of the haem and—particularly important in the tropics—they may be due to nutritional iron deficiency or iron deficiency after chronic haemorrhage. For a detailed account of these disorders the reader is referred to the original review. *H. Lehmann*

See also p. 881, DRAPER, **Effect of Malaria Control on Haemoglobin levels.**

NARAYANAN, M. S. **Hypoferraemia and Oedema following Antimegaloblastic Therapy.** *J. Indian Med. Ass.* 1960, Apr. 1, v. 34, No. 7, 267–72, 1 fig. [17 refs.]

This well-written paper confirms the accepted view that effective treatment of patients with B12 deficiency causes a fall in the serum iron before the clinical or reticulocyte response occurs. The subjects were 35 adult males and 3 non-pregnant females in South India, and after observation (including marrow examination) each was given an injection of 150 μgm. of vitamin B12. A fall in the serum Fe from over 100 to 20–30 μgm./100 ml. was seen in all 12 of the patients with megaloblastic marrows. A less pronounced but constant fall occurred in 15 subjects whose marrow showed intermediate megaloblastic change, but no significant change occurred in patients with normoblastic marrows. In those who had thus responded to B12, the administration 8 days later of 25 mgm. of folic acid caused a second (though necessarily less marked) fall in serum Fe.

A new observation was that 11 of the patients who had shown a response developed varying degrees of oedema; this appeared within a week of B12 treatment, and increased after folic acid was given. 9 of these patients had a

low initial serum Fe, and there was no tendency for it to rise after the initial fall. Changes in serum protein content were followed in 5 of those who became oedematous; in 3 cases there was no fall, and in 2 cases the fall was only to 4·66 and 5·45 gm./100 ml. respectively. The oedema therefore appears to be chiefly related to hypoferraemia and low iron stores, and this agrees with clinical experience in South India that oedema is commoner in long-standing iron deficiency than in other anaemias. Its mechanism is uncertain, though it may be related to increased capillary permeability from local anoxia. However, any possibility that there may be depleted iron stores should lead to iron therapy, either before or together with the use of antimegaloblastic drugs.

Alan B. Raper

WEATHERALL, D. J. & VELLA, F. **Thalassaemia in a Gurkha Family.** *Brit. Med. J.* 1960, June 4, 1711–13, 1 chart.

Hypochromic anaemia in a Gurkha child of 3 years, resistant to iron and needing repeated transfusions, led to an investigation of the family; the parents and 4 siblings all showed most of the characteristics of thalassaemia minor, the propositus having the major form of the disease. *Alan B. Raper*

DELANNAY, M. Nos sicklanémiques et leur destin. [**The Outlook for Sickle-Cell Anaemia Patients**] *Ann. Soc. Belge de Méd. Trop.* 1959, Dec. 31, v. 39, No. 6, 817–22, 1 fig.

Of 60 patients with sickle-cell anaemia among the children of employees of a mining concern in the Congo, 26 were aged 1 to 4, 17 were aged 5 to 9, and 17 were aged 10 to 17. There were 14 adolescents (ages 12–17), of whom 4 were in excellent health, 7 quite well, and only 1 seriously ill; 1 had a palpable spleen, and all had some cardiac enlargement.

In a previous period of 4 years there had been 20 deaths in hospital from sickle-cell anaemia, 18 of them in children under 3 years. Infections had proved to be the commonest event leading to death.

Repeated transfusions, antibiotics to reduce the strain on haemopoiesis during infections, and cortisone, were the main lines of treatment; and with these the author takes a more cheerful view of the prognosis than previously. He adds that careful parents and a hospital near at hand are also important, and with all these expects most affected children at least to attain adolescence.

Alan B. Raper

RAPER, A. B., AGER, J. A. M. & LEHMANN, H. **Haemoglobin "Singapore-Bristol". A "Fast" Haemoglobin found in Infants.** *Brit. Med. J.* 1960, May 21, 1536–9, 5 figs.

2 children aged 2½ years were seen in Bristol but were respectively of French, Portuguese, East-Indian and English, and of West-Indian and English parentage. They were suffering from an iron deficiency anaemia which responded to treatment. In addition to normal adult haemoglobin (A) and traces of normal foetal

haemoglobin (F) an abnormal "fast" haemoglobin was found in these children which was absent in their parents. It was considered likely that this component was an abnormal foetal haemoglobin.

On comparison it was found to be indistinguishable from a haemoglobin which VELLA had found in Chinese infants but not in their parents [this *Bulletin*, 1960, v. 57, 285]. There was no convincing chemical evidence that the pigment was a foetal haemoglobin. The resistance to alkali denaturation was not increased, and the ultraviolet spectrum was not definitely of the foetal type. The authors do not therefore exclude the possibility that they were dealing with a recessive character in the adult series.

The first description of an abnormal foetal haemoglobin by FESSAS and PAPASPYROU [*ibid.*, 1958, v. 55, 444] fits the present haemoglobin as regards electrophoretic mobility at alkaline *p*H and the absence of raised resistance to alkali denaturation (but not as regards electrophoretic mobility at acid *p*H). Vella and others have therefore previously referred to this haemoglobin as "haemoglobin of Fessas and Papaspyrou". However Fessas has recently come to the conclusion that he must have been dealing with the abnormal foetal haemoglobin, since described as "haemoglobin Bart's" (*Brit. Med. J.*, 1959, Oct. 31, 886). It is for this reason that the authors, after consultation with Vella who had reported the same haemoglobin from Singapore, have named the haemoglobin "Singapore-Bristol". In an Addendum mention is made that a similar or identical haemoglobin has been seen in Negro infants in the U.S.A. (MINNICH *et al.*, *J. Dis. Children*, Chicago, 1959, v. 98, 488) and in Nigerian infants [HENDRICKSE *et al.*, this *Bulletin*, 1960, v. 57, 631].

H. Lehmann

ALLISON, A. C. **Glucose-6-Phosphate Dehydrogenase Deficiency in Red Blood Cells of East Africans.** *Nature*. 1960, May 14, v. 186, 531–2. [10 refs.]

About 11% of American Negro males have a sex-linked abnormality of their red cells which finds full expression in the males and homozygous females, and partial expression in the heterozygous females. The defect consists in a low activity of the red-cell enzyme glucose-6-phosphate dehydrogenase and is associated with liability to develop haemolysis when treatment is experienced with antimalarial drugs of the primaquine and pamaquin type. Certain other drugs and ingestion of broad beans (*Vicia faba*) may also cause haemolytic crises; in the case of the fava bean the condition is known as favism.

The defect has been demonstrated in numerous Mediterranean populations and in South-East Asia. No surveys have as yet been published from East Africa [for a study in Nigeria, see this *Bulletin*, 1960, v. 57, 514]. The present paper records high gene frequencies for this abnormality in 7 East African populations, varying from 15·0 to 28%. They were Giriama, Bondei, Sambaa, Digo, Zigua, Luo and Ganda. All came from malarious areas and were in striking contrast to 2 tribes—Kikuyu and Masai—where the gene frequency was respectively 2·9 and 1·7%. These 2 tribes reside in non-malarious regions, and the author suggests that the trait may be maintained by a balance of selective forces whereby the disadvantage of carrying the gene either as a male hemizygote or as a female hetero- or homozygote is balanced by protection

against malaria and possibly in other ways. The author refers to some unpublished work where he and D. F. CLYDE have obtained evidence that young malaria-susceptible East African children of both sexes, from a region where *P. falciparum* is holo-endemic, show lower parasite counts when deficient in enzyme *H. Lehmann*

PLAGNOL, H., CASTETS, M., MALLET, M. & BOIRON, H. Étude de la protidémie de l'Africain résidant à Dakar. Variations physiologiques provoquées par la croissance. [**Protein Studies in Africans living in Dakar. Physiological Variations with Age**] *Bull. Soc. Méd. Afrique Noire Langue Française.* Dakar. 1959, v. 4, No. 4, 445–64, 3 figs. [36 refs.]

Estimations were made in 569 Africans of serum levels of total protein and of albumin and globulin fractions, including globulins alpha 1 and 2, beta, and gamma. The subjects were in health and represented all age-groups up to 35 years. They comprised: 152 pregnant women at term, 149 infants at birth, 18 infants 1–4 months, 58 children 6 months–6 years, 113 schoolchildren 6–16 years, 54 young people 17–21 years, and 25 adults 25–35 years. Serum protein fractions were measured by paper electrophoresis.

It was found that the serum protein pattern and albumin/globulin ratio in the newborn and in the adult were very similar. Total protein was lower in infants 1–4 months old, there being less albumin and gamma globulin. Globulins alpha 2 and beta rose immediately after birth but globulins alpha 1 and gamma showed no increase until the age of 3–4 months. It is suggested that before the age of 4 months the Dakar child cannot respond usefully, by antibody formation, to infections and vaccines. Owing to progressive increase in gamma globulin, total globulins reached adult levels at about 6 years of age; albumin showed a much slower rise with age.

It is concluded that in comparison with the European, the serum of the Dakar African is poorer in albumin but has more gamma globulin. The albumin/globulin ratio is frequently less than 1, even in health, whereas figures of 1·5–1·7 are quoted for Europeans. The observed increase in albumin with age contradicts a report by HOLEMANS and MARTIN [see this *Bulletin*, 1954, v. 51, 827] but is taken to reflect reasonable living conditions in Dakar. *C. S. Leithead*

GILLES, H. M. & MCGREGOR, I. A. **Studies on the Significance of High Serum Gamma-Globulin Concentrations in Gambian Africans. I. Gamma-Globulin Concentrations of Gambian Children in the First Two Years of Life.** *Ann. Trop. Med. & Parasit.* 1959, Dec., v. 53, No. 4, 492–500, 1 chart. [14 refs.]

3 groups of children in the Sukuta area were kept under the closest medical surveillance. After random allocation at birth, Group A received chloroquine and Group B pyrimethamine weekly. Group C received a placebo, and all incidents of illness in this group were treated—by antimalarials if indicated. Customary feeding habits were not disturbed.

At birth the gamma globulin content of the serum (20% of the total protein) paralleled that found in Uganda [HOLMES *et al.*, this *Bulletin*, 1956, v. 53, 230].

In Groups A and B this raised level fell slightly until the 6th month, began to rise again by the 9th month, and had returned to the birth level by the end of the first year. At this time the children in Group C did not show significantly different levels from those in Groups A and B. During this period none of the treated children developed malaria, but in Group C 19 of the 29 showed parasitaemia, lasting on the average 25 days. Other illnesses were common, but not more frequent in Group C than in the other groups.

At the end of 24 months, no significant change had occurred in the gamma globulin content of the serum in Groups A and B, but in Group C there was a significant rise to 26·1% of total protein. The following mean figures are drawn from the larger tables published:—

	Total protein (gm./100 ml.)			Gamma globulin (gm./100 ml.)		
Group	A	B	C	A	B	C
At 12 months	6·26	6·25	6·38	2·82	2·87	3·03
At 24 months	6·33	6·28	6·26	2·97	2·97	3·28

The authors find it impossible to determine whether the high values during the first year are due to genetic, nutritional, or general infective factors. They do however consider that the rise that ensues in the second year is produced by sustained malarial parasitaemia.

[See also this *Bulletin*, 1957, v. 54, 389.] *Alan B. Raper*

VENOMS AND ANTIVENENES

RUSSELL, F. E., EMERY, J. A. & LONG, T. E. **Some Properties of Rattlesnake Venom following 26 Years Storage.** *Proc. Soc. Exper. Biol. & Med.* 1960, Apr., v. 103, No. 4, 737–9, 1 fig. [14 refs.]

"In mice and cats, dried *Crotalus* venoms stored in closed containers at 42°F to 82°F in the dark for 26 to 27 years retained most of their lethality, their ability to depress neuromuscular junction, and the properties responsible for the deleterious changes in the arterial, venous and cisternal pressures, respiration, electrocardiogram, and electroencephalogram."

MASTER, R. W. P., BHARUCHA, E. D. & RAO, S. S. **Blood Sugar, Cholesterol and Phosphorus Levels in Rabbits after Injection of Russell's Viper Venom.** *Indian J. Med. Sci.* 1960, Apr., v. 14, No. 4, 335–7.

LANDMANN, J., LEAL, L. C. & DE CARVALHO, H. Insuficiência renal aguda por veneno de cobra. [**Acute Renal Insufficiency from Cobra Venom**] *Bol. Centro Estudos Hosp. Servidores Estado.* Rio de Janeiro. 1960, Feb., v. 12, No. 2, 117–24, 3 figs. [33 refs.] English summary.

Account of a case in Rio de Janeiro with survival.

STEINBECK, A. W. **Nephrotic Syndrome developing after Snake-Bite.** *Med. J. Australia.* 1960, Apr. 2, v. 1, No. 14, 543–5. [17 refs.]

"A history is presented of a case of nephrotic syndrome developing acutely after a snake-bite, in which there was convincing evidence of envenomation. The snake was not identified.

"The evidence suggests a causal relationship between envenomation and the nephrotic process, so that snake-venom would seem an additional possible cause of the nephrotic syndrome."

PHLEPS, D. R. **Stone-Fish Poisoning.** *Med. J. Australia.* 1960, Feb. 20, v. 1, No. 8, 293–4.

Stone-fish (*Synanceja trachynis*) inhabit the coastal waters of New Guinea and Papua, living among the coral reefs where their camouflage makes them almost invisible. Their weapon consists of a row of dorsal spines, up to 13 in number, and from these an intensely cytolytic toxin is injected into the foot of any fisherman who is so unfortunate as to tread on them. Such an accident is followed by excruciating local pain, rapidly developing oedema and subsequently much tissue necrosis. Shock may be severe.

Before the introduction of a specific antivenene produced at the Commonwealth Serum Laboratories at Melbourne, the authors had treated 10 patients by the injection of 0·5–1·0 ml. of a solution of emetine hydrochloride (1 grain in 1 ml.) into each puncture site [this *Bulletin*, 1959, v. 56, 1185]. Provided this was done within 60 minutes of envenomation pain was rapidly relieved, oedema was controlled and tissue necrosis was prevented. All patients were discharged as cured within 4 days of admission to hospital.

The specific antivenene has been combined with the above treatment in 2 additional patients, a single dose of 2 ml. being injected intramuscularly at the earliest possible moment. The results of this combined treatment were excellent, the patients being fit for discharge in 2 days. *J. H. Walters*

TOXOPLASMOSIS

SOURANDER, P., LYCKE, E. & LUND, Ebba. **Observations on Living Cells infected with** *Toxoplasma gondii*. *Brit. J. Exper. Path.* 1960, Apr., v. 41, No. 2, 176–8, 10 figs. on 2 pls. [13 refs.]

"A study was made with phase contrast microscopy on the propagation of the RH strain of *Toxoplasma gondii* in cultures of cancer cells of the Detroit-6 strain and trypsinized human embryo kidney cells. Particular attention was paid to the different phases and the rate of multiplication of the parasites, their relation to the nucleus and the forming of cyst-like structures in the host cells."

SCHMIDTKE, L. & MÖBEST, H. Beitrag zur serologischen Diagnostik der Toxoplasmose. [**Observations on the Serological Diagnosis of Toxoplasmosis**] *Zent. f. Bakt.* I. Abt. Orig. 1960, v. 179, No. 1, 141–7. [11 refs.]

STROCZYNSKA, M., UMINSKI, J. & TOS-LUTY, S. Ocena metod ciepłej i zimnej odczynu wiązania dopełniacza. [**Evaluation of the Warm and Cold Methods of the Complement-Fixation Reaction in Toxoplasmosis Diagnosis**] *Wiadomości Parazytologiczne*. Warsaw. 1959, v. 5, No. 6, 531–6, 1 fig. English summary.

A comparison has been made of the effects of fixation at 4°C. for 18–24 hours and at 37°C. for 1 hour respectively upon the results of the complement-fixation test for the diagnosis of toxoplasmosis. In an examination of 282 human and 5 rabbit sera, positive results were obtained in 16 instances (5·6%) with fixation at 37°C. and in 49 (17·4%) with fixation in the cold, and the latter method also gave somewhat higher titres. In 39 sera also examined by the dye test agreement in the results was obtained in 61·5% of cases by fixation at 37°C. and in 66·6% by cold fixation, and in 62 subjects also examined by the Frenkel intradermal test agreement was obtained in 54·8% and 58·06% by warm and cold fixation respectively. *D. J. Bauer*

SIKORSKI, R., STROCZYNSKA, M. & TOS-LUTY, S. Toksoplazmoza u kobiet ciężarnych i próba oceny metod diagnostycznych. [**Toxoplasmosis in Pregnant Women and attempt to evaluate the Diagnostic Methods**] *Wiadomości Parazytologiczne*. Warsaw. 1959, v. 5, No. 6, 541–51, 1 fig. [10 refs.] English summary.

An investigation has been made of the association between toxoplasmosis and pathological conditions of pregnancy in 396 pregnant women treated in a maternity hospital in Lublin, Poland. 7 infants with congenital defects were born to 174 mothers suspected of suffering from toxoplasmosis, among whom the complement-fixation test gave a positive result in 17 (9·7%), the dye test in 19 (10·9%) and the intradermal test in 64 (36·7%) instances. The corresponding figures for 222 mothers with no evidence of toxoplasmosis were 16 (7·2%), 23 (10·3%) and 70 (31·8%) for the 3 tests respectively. Of 232 pregnancies in women with established toxoplasmosis 76 (32·7%) ended in miscarriage, compared with 72 (21·2%) of 339 pregnancies in women with no evidence of infection. Among the 396 women examined the intradermal test gave a positive result in 134 (33·8%), the dye test in 42 (10·6%) and the complement-fixation test in 33 (8·3%) instances. The results of the 3 tests were in agreement in 225 instances (56·7%). The intradermal test appears to be the most useful for the routine diagnosis of toxoplasmosis. *D. J. Bauer*

SIMITCH, T., PÉTROVITCH, Z., BORDJOCHKI, A. & TOMANOVITCH, B. Contribution à la connaissance de la virulence de *Toxoplasma gondii* pour *Carduelis carduelis* L. [**Virulence of *Toxoplasma* for Goldfinches**] *Arch. Inst. Pasteur d' Algérie*. 1959, Sept., v. 37, No. 3, 409–11.

72 goldfinches (*Carduelis carduelis*) were inoculated by mouth or intraperitoneally with 2 strains of *Toxoplasma*, RH and a Yugoslavian strain. Both produced acute infections, but RH proved to be more virulent than the local strain. *C. A. Hoare*

DERMATOLOGY AND FUNGUS DISEASES

LONDERO, A. T. & FISCHMAN, O. Piedra branca. A propósito de una modalidade do Rio Grande do Sul (Brasil) e de seu agente causador. [**White Piedra. A Variety in Rio Grande do Sul (Brazil) and its Aetiological Agent**] *Rev. Inst. Med. Trop. São Paulo.* 1959, Nov.–Dec., v. 1, No. 4, 260–65, 2 figs. [22 refs.] English summary.

2 cases of a clinical variety of white piedra were discovered by the authors in Santa Maria, Rio Grande do Sul (Brazil). 2 cases of this form of piedra had been found previously by RIBEIRO (*Arq. Riograndenses Med.*, 1937, v. 16, 543) in Porto Alegre.

On comparing the various microscopical features revealed in their material with those shown by 10 strains of *Trichosporon beigelii* the authors came to the conclusion that their strains were identical with this species.

The authors furthermore described in detail the type of pilar lesion caused by this organism, showing that it attacked the tip of the hair, producing a form of "coif" or "hood" and causing splitting of the portion of the hair which was included in the nodule. *C. J. La Touche*

MCNALL, E. G., SORENSEN, L. J., NEWCOMER, V. D. & STERNBERG, T. H. **The Role of Specific Antibodies and Properdin in Coccidioidomycosis.** *J. Investigative Dermat.* 1960, Mar., v. 34, No. 3, 213–16. [14 refs.] Discussion 216–17.

In view of the varying degrees of cross-reactivity shown by the antigens of 3 systemic fungi, namely, *Coccidioides immitis, Blastomyces dermatitidis* and *Histoplasma capsulatum,* in the course of skin tests and serological tests, it was felt by these authors that some antigens common to these fungi might be detectable in a study of the cell wall polysaccharides and their effect on the properdin system.

Accordingly, antigenic polysaccharides from the mycelium of *Coccidioides immitis* (Barry strain) were fractionated by a process which is described by these authors.

Antibody synthesis was then induced by P_1X polysaccharide fractions, the antibodies being demonstrated at a low titre in the first week and increasing "to a plateau at the fourth week". It was found that the most satisfactory route for administration of polysaccharide P_1X was the subcutaneous route. As a result of these injections partial protection was conferred on mice when this polysaccharide was injected at low levels, while at high levels it significantly increased the death rate.

The fraction P_1L lipopolysaccharide was shown to bind properdin and all four components of complement, causing the lysis of erythrocytes and "an erythematous reaction when injected into mice". P_1X polymer has a much "lower binding affinity to properdin than the lipopolysaccharide".

The significance of properdin is that patients and experimental animals with the disseminated form of coccidioidomycosis have consistently low levels of this substance, and Negroes, who are more susceptible than are Caucasians to the disseminated form of this disease, also have lower properdin levels than have Caucasians. *C. J. La Touche*

CONTI-DÍAZ, I. A., YARZÁBAL, L. A. & MACKINNON, J. E. Lesiones cutáneas, orofaringeas, rectales y musculares por inoculación intracardíaca de *Paracoccidioides brasiliensis* al cobayo y al conejo. [**Cutaneous, Oropharyngeal, Rectal and Muscular Lesions after Intracardiac Inoculation of** *Paracoccidioides brasiliensis* **to the Guineapig and the Rabbit**] *An. Facul. de Med. Montevideo.* 1959, v. 44, Nos. 5/6, 601–7, 15 figs.

The English summary appended to the paper is as follows:—

"The intracardiac inoculation of yeast-like cultures of *Paracoccidioides brasiliensis* to the guineapig and the rabbit showed, besides some lesions of the viscera and of the lymph nodes, the rapid development of lesions in the skeletal muscles, in the tongue, the rectum and the skin, especially in the eyelids (fig. 1 and 6), muzzle (fig. 2, 4 and 7), ears (fig. 1) and around the anus and genital orifices (fig. 3). Some histopathological features are in favour of the existence of a relationship between the cutaneous periorificial lesions and lesions of the cutaneous muscles (fig. 8, 9, 10, 13, 14 and 15) and of skeletal muscles of the head having a cutaneous insertion.

"Subcutaneous and cutaneous lesions were also observed in other areas and sometimes these lesions could be related to lesions of the underlying skeletal muscles.

"The lesions of the rectum began in the corion of the mucosa, in the external layer of longitudinal smooth fibers and in striated perirectal muscles.

"The myositis being an important feature in the three species of animals assayed it is presumed that the same occurs in man."

[See this *Bulletin*, 1960, v. 57, 293, 407.]

TROPICAL OPHTHALMOLOGY

See also p. 958, HAFEZ & ATTIA, (i) **Studies on the Ecology of** *Musca sorbens* **Wied. in Egypt (Diptera: Muscidae),** (ii) **On the Developmental Stages of** *Musca sorbens* **Wied., with special reference to Larval Behaviour (Diptera: Muscidae),** (iii) **The Relation of** *Musca sorbens* **Wied. to Eye Diseases, in Egypt (Diptera: Muscidae).**

DE FREITAS, C. A. Tracoma no Nordeste Brasileiro. [**Trachoma in North-East Brazil**] *Rev. Brasileira Malariologia.* Rio de Janeiro. 1959, Jan., v. 11, No. 1, 59–66, 1 map. [12 refs.] English summary.

The author points out that trachoma is generally associated with sub-standard ambient and personal hygienic conditions and poor diet, and though it is a mass infection the virus has a low infecting power; its antigenicity thus is low and hence does not confer immunity.

Investigations were carried out in north-east Brazil in 191 administrative areas in 7 states covering an area of some 380,000 sq. km. [the figures in the text and in the summary differ]. There is a population of close on 6 million persons. Of 70,273 subjects, chiefly schoolchildren, examined, the percentage found positive varied from 0·4–94·6, and 73 of the administrative areas had an incidence of over 20% of their populations.

Thus, on the basis of this investigation the author estimates that in this large area of Brazil there are about half a million cases. The incidence was higher in the rural areas, and in cities where conditions of life are reasonably good the disease is not a real health problem. Poverty is the most potent predisposing cause, while the migration of the population to more productive areas, which occurs particularly in the dry season, is an important factor in its spread. Water scarcity causes a marked rise in migration. In certain areas there were veritable pockets of infection where the incidence was not less than 85% of the total population, and there seems to be some synergistic action when dietetic factors are added to the other epidemiological factors mentioned.

As regards prevention, flying squads have been set up to give mass treatment in the rural areas to persons with transmissible eye conditions, education in simple hygiene is given, there is improvement of water supplies and there are special treatment units at focal points of migration. Treatment has been by oral sulphonamides and local antibiotic ointment, 35% of patients being cured by the first cycle of treatment; new schemes of parenteral antibiotic treatment are being tried.

The author concludes that as the substandard dietetic and hygiene conditions are very much a long-term problem the mass house-to-house treatment offers the best hope of reducing the incidence to manageable proportions.

W. K. Dunscombe

MURRAY, E. S., BELL, S. D., Jr., HANNA, A. T., NICHOLS, R. L. & SNYDER, J. C. **Studies on Trachoma. I. Isolation and Identification of Strains of Elementary Bodies from Saudi Arabia and Egypt.** *Amer. J. Trop. Med. & Hyg.* 1960, Mar., v. 9, No. 2, 116–24, 2 figs. [29 refs.]

The authors isolated 19 strains of virus, with the general characters of the psittacosis-lymphogranuloma group, from the conjunctival scrapings of 45 children in Saudi Arabia and Egypt with clinical trachoma. The scrapings, which were all positive microscopically, were injected into chick embryos by the yolk sac route. 9 of these strains were studied in detail. They were typical in morphology and staining characters, insensitive to streptomycin, possessed the heat-stable antigen of the group and were toxic for white mice when injected intravenously. 1 strain was shown to be capable of producing conjunctivitis with typical inclusions in a chimpanzee.

S. P. Bedson

GRAYSTON, J. T., WANG, San-Pin, WOOLRIDGE, R. L., YANG, Yen-Fei & JOHNSTON, P. B. **Trachoma—Studies of Etiology, Laboratory Diagnosis, and Prevention.** *J. Amer. Med. Ass.* 1960, Apr. 9, v. 172, No. 15, 1577–86, 1 fig. [17 refs.]

This paper reports the isolation of 5 strains of trachoma virus from cases of this disease on Taiwan; injection of eye material into the yolk sac of chick embryos was the method employed. With 1 of these strains typical trachoma was produced in 6 human volunteers, and again, with 1 strain, mice (adult and infant), white rats, hamsters, rabbits, parakeets, and lonchuras were inoculated

by various routes, with negative results. Their ability to produce an acute follicular conjunctivitis in the Taiwan monkey, *Macaca cyclopis*, was demonstrated with 2 strains. Tests made with 1 strain showed it to be sensitive to penicillin, chloramphenicol, oxytetracycline, Furaltadone and sulfisoxazole but not to streptomycin.

By complement-fixation both group and specific antigens were demonstrated in these strains of trachoma virus, but only about a third of the patients' sera examined contained antibodies and these were for the specific antigen and only in low titre. Purified specific antigen was prepared from yolk sac suspensions by digestion with trypsin followed by differential centrifugation and finally precipitation with polymyxin.

Purified virus inactivated with 0·04% formaldehyde was shown to give a skin test of the delayed tuberculin type and to evoke the production of specific antibodies in monkeys and man. Its antigenicity was improved by the incorporation of 2% aluminium hydroxide.

The use of such a vaccine both prophylactically and therapeutically is discussed in the light of some preliminary findings. *S. P. Bedson*

See also p. 910, Vrancic & Mimica, Nalaz entamebe histolitike kod kroničnog horioretinitisa. [**The Association of Chronic Chorioretinitis with Amoebiasis**]

Grayston, J. T., Wang, San-Pin & Johnston, P. B. **Etiologic Studies of Trachoma on Taiwan.** *Proc. Soc. Exper. Biol. & Med.* 1960, Mar., v. 103, No. 3, 596–9. [15 refs.]

This paper reports the results of an investigation made on the eyes of children on Taiwan to discover what part, if any, adenoviruses had in producing the trachoma syndrome either alone or with the trachoma virus [*Bull. Hyg.*, 1960, v. 35, 203 *bis*]. The material came from 922 children who were placed, on clinical grounds, in 1 of 3 categories: trachoma, conjunctivitis or nothing pertinent. It was examined for trachoma virus by inoculation of chick embryos by the yolk sac route and for adenoviruses by HeLa cell cultures. 1 adenovirus was isolated from 468 children in the trachoma group and 4 from 374 with chronic conjunctivitis; none was found in 80 children in the "nothing pertinent" category, an isolation rate of 0·5%. 4 strains of virus with the characters of the psittacosis-lymphogranuloma group—presumably trachoma virus—were obtained from 75 children in the clinical trachoma group; they all came from children in stage II of the disease. Material from 20 children in the conjunctivitis category and from 5 in the NP group was examined for trachoma virus with negative results. *S. P. Bedson*

Ławinski, L. Hypodermoza oka u 3-letniego chłopca. [**A Case of Hypodermosis of the Eye of a 3-Year-Old Boy**] *Wiadmości Parazytologiczne.* Warsaw. 1960, v. 6, No. 1, 77–9, 1 fig.

The English summary appended to the paper is as follows:—

"In May 1958 an unknown parasite was received for investigation by the Eye-Department of the hospital at Bydgoszcz. The parasite had been found in

the front eyeball ventricle of a 3-year-old boy. Closer investigations revealed that it was *Hypoderma lineatum* (de Villers) larva responsible for the ophthalmomyasis the boy was suffering from. This is the first written report of an ophthalmomyasis caused by the larva of *H. lineatum* in this country."

TROPICAL ENVIRONMENTAL CONDITIONS

SARGENT, F. & JOHNSON, R. E. **Observations on Experimental Anhidrosis.** *Lancet.* 1960, May 7, 1018–20. [21 refs.]

In support of a recent observation [BANNISTER, this *Bulletin*, 1960, v. 57, 410] of anhidrosis in British soldiers in Aden, the authors describe their own encounters with anhidrosis and hypohidrosis in subjects of nutritional physiological studies made in hot weather in 1953 and 1955. They use the term anhidrosis to indicate that the skin of a subject so described was by inspection and palpation dry and hot over the trunk and extremities and in the axillae and groin. Hypohidrotic subjects had wide areas of hot dry skin but in other areas sweating could be detected.

108 men were studied. They lived and worked, marching 3–12 miles daily, on specially designed diets, and this paper concerns a group of 46 in whom water intake was restricted to 900–910 ml. per head per day. In this group, 4 cases of anhidrosis and 8 of hypohidrosis were observed. After water intake had been increased, no further cases occurred, and sweating was normal in the other 62 subjects whose water intake was not restricted.

The 4 cases of anhidrosis are described in detail. None had skin lesions or hyperpyrexia. Symptoms preceding and associated with the anhidrosis included weakness, fatigue, dizziness, headache, nausea, and thirst, and moderate fever was a feature. Water-tolerance tests on 3 of the anhidrotic subjects provoked an outburst of sweating respectively within 1, 8 and 60 minutes of the test. The 4th man, when afebrile but still anhidrotic, was made to march in the heat. He marched at 3·75 m.p.h. for 1·5 miles, had a peak rectal temperature of 101·4°F., and a sweat loss of 850 ml. per hour.

It is concluded that these observations suggest that dehydration predisposes to anhidrosis and hypohidrosis, raise new problems in the physiology and pathophysiology of sweating, and have a bearing on the pathogenesis of heatstroke.

[This paper contains a great deal of valuable and welcome information. One point made in the discussion may be misleading. It is stated that the anhidrotic and hypohidrotic subjects had no clinical signs of heat exhaustion. If the term heat exhaustion is unqualified, it may properly be taken to mean exhaustion due to primary dehydration, or exhaustion due to salt deficiency with secondary dehydration. All of the 4 cases of anhidrosis described had symptoms and signs of dehydration, and in one case the combination of muscle cramps and orthostatic hypotension is suggestive of salt deficiency.] *C. S. Leithead*

MISCELLANEOUS DISEASES

SHAPER, A. G. & WILLIAMS, A. W. **Cardiovascular Disorders at an African Hospital in Uganda.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1960, Jan., v. 54, No. 1, 12–28, 10 figs. (7 on 2 pls.) [42 refs.] Discussion 29–32 with 3 further refs. [MCMICHAEL, J.; TROWELL, H. C.; MCROBERT, G.; PALLISTER, R. A.; WILLIAMS, A. W. (in reply).]

In this communication, heart disease as seen at Mulago Hospital, Uganda, from 1955 to 1957 is surveyed. Cardiovascular disorders accounted for some 10% of the medical admissions to the hospital in 1957; approximately half the patients were from Buganda and the next largest groups were from the Belgian mandated territories of Ruanda-Urundi and from western and south-west Uganda. A detailed analysis is given of the cardiovascular problems encountered at the hospital during the 3-year period and from this it is clear that the major problems are hypertension, syphilitic aortitis, rheumatic heart disease and endomyocardial fibrosis. It is also clear that some of the cardiovascular disorders important in the more sophisticated communities and temperate climates of Europe and North America, such as coronary heart disease, cor pulmonale and thyrotoxicosis, are virtually absent in this population.

Hypertension in those under 40 years of age is of renal origin in approximately 85% of cases; over this age, essential hypertension becomes frequent but renal hypertension remains common. This situation is no doubt related to the fact that chronic nephritis and pyelonephritis are among the commonest disorders encountered at the hospital.

Syphilis in 1955–57 accounted for some 12·5% of cardiovascular disorders encountered at the hospital. It is difficult to know whether the incidence of this infection is decreasing at Mulago, but whatever the true rate of decrease, the level of 3% of organic cardiovascular disease attributed to syphilis in England will not be reached for many years. The difficulty of recognizing syphilis in these patients is emphasized and it is stated that on several occasions syphilitic cardiovascular disease was found at autopsy in patients who had been fully investigated during repeated admissions and clinically diagnosed as arteriosclerotic, degenerative heart disease or endomyocardial fibrosis.

Pericarditis secondary to pneumonia, tuberculous pericarditis and bacterial endocarditis were all encountered, and of each more was seen in males than in females.

Acute rheumatic fever and carditis were not commonly encountered but chronic rheumatic heart disease was common and comprised 13% of all cardiovascular admissions.

Endomyocardial fibrosis accounted for 14% of all cardiovascular admissions, and readers of this *Bulletin* will be familiar with its features. Of every 10 patients with endomyocardial fibrosis, confirmed at autopsy, 3 had presented clinically with heart failure without other distinguishing features, 3 with lone mitral incompetence, and one each with lone tricuspid incompetence, combined mitral and tricuspid incompetence, pericardial effusion, and obliterative fibrosis of the right ventricle. Endomyocardial fibrosis, it is stated, resembles, both pathologically and on clinical and radiographic examination, rheumatic heart disease but clear mitral stenosis seldom occurs in endomyocardial fibrosis and the aortic valve is not involved. An important clinical guide to the diagnosis

of endomyocardial fibrosis is that it should be considered in the absence of mitral stenosis, aortic incompetence or pericardial calcification and in the presence of gross mitral or tricuspid incompetence or both, with pulmonary hypertension, or of heart failure without specific features.

Analysis of medical patients admitted to the hospital suggests that people from Ruanda-Urundi have a greater liability to endomyocardial fibrosis than the Uganda people from the neighbourhood of Kampala. The age incidence of endomyocardial fibrosis, its clinical and pathological features suggest that it might represent a modified form of rheumatic heart disease.

Coronary heart disease was rarely seen in Africans but was common in the 4th and later decades among the local Asian population and a recent study of coronary heart disease, diet and serum cholesterol levels in Africans and Asians in Kampala showed significantly different mean values for serum cholesterol at all ages [this *Bulletin*, 1960, v. 57, 76].

Despite a very high incidence of tuberculosis, bronchiectasis and chronic pulmonary fibrosis, cardiovascular disorder secondary to disease of the lung parenchyma (cor pulmonale) is very unusual.

Heart disease of undetermined aetiology accounted for 11·8% of patients and it is stated that in many of these the diagnosis lay between endomyocardial fibrosis and rheumatic heart disease.

In the discussion that followed Professor J. McMichael emphasized the increasing frequency with which hypertension in Britain was being found to be secondary to renal causes. An underlying renal cause of malignant hypertension had been demonstrated in over 50% of his total cases. He gave a warning concerning the risk of error in confusing endomyocardial fibrosis with other types of endomyocardial thrombosis, fibro-elastosis and fibro-plastic endocarditis, which are probably different disorders. He expressed doubt regarding elevated serum cholesterol as a factor determining the higher incidence of coronary occlusion in Asiatic and European peoples. There were many other factors to be considered and, for example, the low incidence in Africans might be compared with the lower incidence in women as compared with men, and in this connexion the secondary sexual characteristics in African males are not uncommonly ill-developed. It had recently been shown that in women the coronary blood flow per unit weight of heart is greater, and thus the coronary arteries seem to be wider in young women than in young men and this may be an important factor in protecting women from occlusion as atheroma develops.

Dr. H. C. Trowell pointed out that many factors operate in the aetiology of disorders such as endomyocardial fibrosis and inheritance and infection could not be excluded although their influence appeared unlikely. He referred to biochemical abnormalities which had been detected in Africans, notably changes in serum proteins, adrenocortical hormones and possibly certain of the serum electrolytes. Evidence suggested that these abnormalities are acquired during periods of malnutrition in infancy; at first they are quickly reversible by improved feeding, but later and in adult life many months or years may be required to change the pattern back to "normal".

Sir George McRobert emphasized the value of visits by first-rate biological and medical scientists to the tropics. He also drew attention to the importance of anaemia as a cause of cardiac dysfunction. "In the tropics take care of the blood and the heart will take care of itself" he said.

Dr. R. A. Pallister stated that he had studied 250 consecutive patients with heart failure in Malaya and not one was thought to be suffering from endomyocardial fibrosis. The commonest diseases in the series were chronic rheumatic heart disease (16%); syphilitic heart disease (6%); ischaemic heart disease (26%); hypertensive heart disease (27%); and pulmonary heart disease (8%). The relatively high incidence of pulmonary heart disease in Malaya as compared with Uganda was of special interest. *A. W. Woodruff*

DAVIES, J. N. P. & COLES, R. M. **Autopsy Experiences with Myocarditis at Mulago Hospital.** *East African Med. J.* 1959, Nov., v. 36, No. 11, 604–9.

It is first pointed out that myocarditis, though previously diagnosed more frequently than is justifiable, occurs not infrequently as part of a general infection by viruses, rickettsiae and bacteria. In poliomyelitis and typhoid it may be important. It is difficult to decide what is genuine myocarditis, for all patients dying of such common diseases as pneumonia and typhoid at Mulago Hospital, Uganda, have a mild to moderate degree of myocardial fibre death and degeneration with an appreciable cellular infiltration. A small number of patients, however, die with clinical evidence of severe heart failure and at post-mortem examination evidence of severe myocarditis, severe muscle damage and very marked cellular infiltration of the myocardium are present. It is with this type of case that the communication deals and those with rheumatic carditis are excluded.

Myocarditis of this kind has been encountered in only 4 children and 5 adults among 3,548 autopsies. 2 of the children had presented clinically with acute heart failure and 2 had had no signs or symptoms of cardiac disease in life. At autopsy, all had large, dilated hearts of which 3 contained ante-mortem adherent thrombi in one or both ventricles. One had soft, pink-white patches in the myocardium which on section were found to be calcified myocardial fibres surrounded by moderate infiltration with lymphocytes, macrophages and plasma cells. In 3 cases there was generalized myocarditis with myofibre death and a diffuse non-perivascular infiltration with lymphocytes and monocytes.

Of the 5 adults 3 were admitted to hospital *in extremis* and died immediately, 1 with pneumonia and 2 with severe cardiac failure. Of the other 2, 1 died of proved typhoid fever and the other with biliary nephrosis and necrosis of the liver. In all, there was moderate myocardial fibre damage and heavy lymphocytic infiltration. In the patient with typhoid there was endocardial oedema and infiltration with an adherent mural thrombus; in this case there was also syphilis and atheroma of the aorta. In 3 cases infiltration of the myocardium was predominantly with eosinophils and in 2 there was extensive necrosis of the myocardium.

In no case could any specific aetiological agent be found and there was no evidence of animal parasites in the cases in which there was eosinophilic infiltration. It was presumed that they were all of viral aetiology. A further possibility is that potassium deficiency may be responsible. In human beings (*Brit. Heart J.*, 1955, v. 17, 5) and in experimental work with rats (*Bull. Johns Hopkins Hosp.*, 1942, v. 71, 235) it has been reported to cause small areas of muscle necrosis, at first infiltrated by polymorphonuclears but later by lymphocytes

and monocytes. It is also suggested that cases of myocarditis of the kind here studied may later develop endomyocardial fibrosis but against this is the observation that the myocarditis and the endocardial damage are more widespread than the areas of the heart involved by endomyocardial fibrosis.

A. W. Woodruff

CAMPBELL, Jean & SOMERS, K. **Serum Transaminase in Endomyocardial Fibrosis.** *Brit. Med. J.* 1960, May 21, 1540–41, 1 chart. [14 refs.]

Endomyocardial fibrosis consists essentially of fibrosis of the ventricular cavity endocardium and of the underlying myocardium [this *Bulletin*, 1954, v. 51, 839]. Histologically acute myocardial necrosis has not been demonstrated. Nevertheless, in view of the difficulty of diagnosing the condition in life the authors have sought to correlate the disease with changes in the serum glutamic oxalacetic transaminase activity which is known to be raised in acute infarction.

24 African patients admitted to Mulago Hospital, Uganda, were examined. They varied in age from 12 to 55 years. All the patients were in congestive heart failure, and the diagnosis of endomyocardial fibrosis was made after exclusion of hypertensive heart disease, heart failure due to severe anaemia aortic valve disease and other conditions. It was based on clinical evidence of pure atrioventricular incompetence—mitral, tricuspid, or both—or heart failure and triple rhythm of apparently obscure origin associated with suggestive electrocardiographic findings. A total of 68 transaminase estimations were carried out but no significant trend was found. Any variation in the results appeared to be completely at random, and serial readings in the same patient did not vary significantly. The mean serum glutamic oxalacetic transaminase value was 26 units with a range of 8–57. The upper limit of normal is 40 units and only 13 of the patients had slightly higher values [this in African patients with heart disease might well be explained on the basis of liver damage].

H. Lehmann

GANATRA, R. D., GAITONDE, B. B. & SHETH, U. K. **Blood Levels of Histamine in relation to Eosinophilia.** *Indian J. Med. Sci.* 1960, Apr., v. 14, No. 4, 328–34, 1 fig. [20 refs.]

The authors established a mean value for the histamine content of the blood (in 14 Indians) of 3·2 μgm./100 ml., and considered values above 10 μgm. to be abnormal. In tropical eosinophilia, with eosinophil counts ranging from 2,178 to 29,502 per cmm., the mean value was 18·0, but the range was wide, and in 10 of the 24 patients studied the histamine content was within normal limits. But in 9 of these patients, studied before and after treatment with diethylcarbamazine, a marked fall in the eosinophil count and histamine level occurred. In 10 asthma patients, whose eosinophil counts ranged up to 1,882 cmm., the histamine levels (mean 22·4 μgm./100 ml.) were not statistically different from those in tropical eosinophilia. If both these conditions are basically allergic responses, it would appear that changes in histamine levels and eosinophil counts are two independent effects of allergy.

Alan B. Raper

BHARGAVA, H. S., CHOUBE, B. S. & JAIN, K. L. **Tropical Eosinophilia and its Treatment with Diethylcarbamazine. (A Controlled and Comparative Study of Oral and Parenteral Diethylcarbamazine.)** *J. Ass. Physicians India.* 1960, Mar., v. 8, No. 2, 117–31, 2 figs. [27 refs.]

This paper records the clinical features, absolute eosinophil counts and erythrocyte sedimentation rates of 41 Indian patients (36 males and 5 females) believed to be suffering from tropical eosinophilia. Cough, breathlessness, some chest pain and limitation of physical activity were common to most, and wheezing attacks and expectoration of mucoid sputum were also common. Circulating eosinophils ranged from 3,000 to 36,000 per cmm. of blood, though in most cases the count lay between 3,000 and 12,000 per cmm.

A comparison was made of the results of treatment with diethylcarbamazine (Hetrazan or Banocide) given either by intramuscular injection (Group A) or by the mouth (Group B). 20 patients were allocated to Group A and these each received two intramuscular injections, one on alternate days over 3 days. The individual dose was calculated on the basis of 6–8 mgm./kgm. body weight; and the average amount of the drug given to each patient was 800 mgm. 21 patients were allocated to Group B and these each received tablets of diethylcarbamazine in a dose calculated on the basis of 8–10 mgm./kgm. body weight daily for 7 days. The average course for each patient was 4·2 gm. Assessment of the effectiveness of treatment was based on the patients' impressions of their condition together with clinical observations, especially of exercise tolerance, rather than upon estimations of numbers of circulating eosinophils, sedimentation rate or radiological changes.

Of 15 patients in Group A followed up for 3 weeks or more, 12 showed complete relief and 3 incomplete relief of their symptoms after treatment. The remaining 5 patients in this group were followed for less than 3 weeks and showed only partial relief. Of 17 patients in Group B followed up for 3 weeks or more, 13 were completely relieved and 4 were partially relieved. Of the remaining 4 patients in this group, followed up for less than 3 weeks, 1 had no relief while 3 showed partial improvement.

No toxic effects of treatment given orally were observed, but minor side effects of injection treatment were noticed: vomiting (3), giddiness (1), pain at the site of injection (2), sense of constriction in the throat (1).

The conclusion reached was that there was no significant difference in the effectiveness of diethylcarbamazine given orally or parenterally in the treatment of tropical eosinophilia. *S. Bell*

JIMÉNEZ DÍAZ, C., VIVANCO, F., RAMOS, F. & SÁNCHEZ MARTÍN, J. A. **Further Studies of Experimental Lathyrism in Rats (Odoratism).** *Bull. Inst. Med. Res.* Madrid. 1958, Jan.–Dec., v. 11, Nos. 1/2/3/4, 23–40, 1 chart. [41 refs.]

PARASITOLOGY: GENERAL

ZELEDON, R. **Comparative Physiological Studies on Four Species of Hemoflagellates in Culture. I. Endogenous Respiration and Respiration in the Presence of Glucose.** *J. Protozoology*. Utica. 1960, May, v. 7, No. 2, 146–50, 1 fig. [18 refs.]

The medium in which the haemoflagellates was grown for these studies was a modification of the diphasic medium described by SENEKJIE [this *Bulletin*, 1944, v. 41, 548]. The source from which the organisms, namely *Endotrypanum schaudinni, Schizotrypanum vespertilionis* and *Schizotrypanum* [*Trypanosoma*] *cruzi* and *Leishmania enriettii* were obtained is indicated. All four were isolated in pure culture in 1957, the first 3 in Costa Rica and the last in Brazil. A record of growth in culture flasks was made by daily counts of the number of parasites present. They were isolated for manometric experiments by centrifugation and washed in phosphate saline and their N content was also determined. Flagellates in the exponential phase of growth were used in each case. Endogenous respiration of each parasite was compared with that in presence of glucose, in terms both of cell number and nitrogen content. The increase in respiration in *E. schaudinni* and *L. enriettii* was considerable in the presence of added sugar, but was small in the other 2 organisms. The first two survive for much shorter periods in its absence than the latter. The importance of a growth medium prepared under standard conditions is emphasized when results with different flagellates are compared. *J. D. Fulton*

GARNHAM, P. C. C. & BRAY, R. S. **The Susceptibility of the Higher Primates to Piroplasms.** *J. Protozoology*. Utica. 1959, Nov., v. 6, No. 4, 352–5, 26 figs.

ŠKRABALO and DEANOVIC [this *Bulletin*, 1957, v. 54, 757] have recorded a case of human infection with bovine piroplasmosis (*Babesia bovis*), which occurred in Yugoslavia in a splenectomized man, living in a tick-infested farm where the cattle had piroplasmosis.

In order to study the susceptibilty of apes to infection with cattle piroplasms, the present authors have carried out experiments with 3 chimpanzees, by inoculating them intravenously with a strain of *B. divergens* from English cattle, the infected blood of which was sent to Liberia (where this work was done) by air. 2 of the apes, which had been splenectomized, were inoculated with the bovine blood, while the 3rd ape, which was intact, was inoculated with the blood of one of the other apes. Both of the latter developed severe infections with piroplasms, whereas the intact animal proved to be resistant. Similarly a splenectomized macaque became infected, but operated rabbits were refractory.

An illustrated description is given of the morphology of the bovine *Babesia* in the simian hosts. The parasites were like those in cattle, though in the chimpanzee they did not occupy the *accolé* position in the erythrocytes, but in the macaque they were typical.

In discussing the implication of these experiments and of the original human infection, the authors suggest that in areas where people are exposed to bites of ticks infected with piroplasms, they might harbour latent infections, but the danger to man arises only in cases when the spleen is removed. Hence, in enzootic areas this operation involves a certain risk. *C. A. Hoare*

PIPKIN, A. C. **Avian Embryos and Tissue Culture in the Study of Parasitic Protozoa. II. Protozoa other than** *Plasmodium*. *Exper. Parasit.* New York. 1960, Apr., v. 9, No. 2, 167–203. [Numerous refs.]

EVANS, A. S. **Immunophysical Methods in Parasitic Infections: a Continuous Electrophoresis Apparatus for Preparative Fractionation of Protein Systems.** *Exper. Parasit.* New York. 1960, Apr., v. 9, No. 2, 105–12, 5 figs.

WILSON, Joyce F., CRASS, Gwendolyn & GARZA, Bettie L. *Pneumocystis carinii* **Pneumonia. Report of a Case and Review of the Recent Literature.** *Pediatrics*. Springfield, Ill. 1960, Mar., v. 25, No. 3, Pt. 1, 468–76, 8 figs. [17 refs.]

The patient was an infant in Texas.

ENTOMOLOGY AND INSECTICIDES: GENERAL ZOOLOGY

[Papers on the toxic effects of insecticides in man are abstracted in the *Bulletin of Hygiene* under the general heading of Occupational Hygiene and Toxicology.]

WEITZ, B. **Feeding Habits of Bloodsucking Arthropods.** *Exper. Parasit.* New York. 1960, Feb., v. 9, No. 1, 63–82. [Numerous refs.]

Most workers interested in the bionomics of blood-sucking arthropods know of the important advances, due to Mr. B. WEITZ of the Lister Institute in England, in the techniques for identifying arthropod blood meals. Many have already obtained valuable information in collaborative work with him in their particular problems on vectors of disease.

In this review article, the author considers first different ways of finding out what hosts arthropods feed on, their reliability and practicability, their limits in interpretation. As a rule, direct observation is not often wholly satisfactory or feasible for rapidly-feeding, winged insects, although undoubtedly useful for wingless insects and acarines. Examination of the blood in the arthropod gut is the method of choice, and that by serological means. Cytological differentiation, however, is not without some value, notably in easy differentiation of mammalian cells from nucleated cells of other animals and birds.

The principles of the precipitin test, and also of the inhibition test, are quite briefly but clearly explained, the latter test due to Mr. Weitz and crucial for differentiating blood of closely related animals. Both methods have been applied successfully to gut-blood samples, smeared and air-dried at room temperature on filter paper, even after 5 years. Good antisera are a prerequisite. A number of technical refinements are emphasized as important to the reliability of results. Also, samples should, as a rule, be of fairly recent blood meals to ensure the presence of antigenic proteins. Negative results among a series of positive insects may well be due, it is pointed out, to antigenic loss in a fairly well digested meal, and are not necessarily evidence of a host other than those tested for.

The second part of the paper sums up some of the more notable findings (some erroneous) by earlier workers, and results and interpretations by the author and numerous associates with the precipitin test and inhibition test as used by him with the refinements and precautions described. Much still remains to be done, and is in progress, with mosquitoes but, in general, anopheline vectors of malaria are very variable in their choice of hosts; culicines are strongly zoophilic, with important preferences by some for birds. Some findings for *Phlebotomus* and *Ornithodoros moubata* in Africa are noted. Tsetse have been more fully and adequately surveyed and a fairly clear pattern of feeding habit emerges for several species. Although, certainly, feeding on man and various animals happens, specific preferences prevail, *e.g.*, *Glossina morsitans* and *G. swynnertoni* (warthog), *G. palpalis* (water-feeding animals), *G. longipennis* (rhinoceros), and *G. pallidipes* (bushbuck or buffalo).

In conclusion, the precipitin test serves well for differentiating meals from man and domestic stock, but the inhibition test is also necessary if wild hosts are to be tested. Samples must be collected widely from a representative range of an arthropod's habitats, if its host choices in nature are to be fully elucidated. This is particularly applicable to vector species (*e.g.*, mosquitoes) partly or wholly of exophilic habit. There is already some support for the concept of races of vector species each of specific feeding habit, which implies important selective effects by insecticides as commonly used in domestic situations. The list of about 140 references is a valuable selection of some of the earlier, as well as current literature in this field. *D. S. Bertram*

BAILLY-CHOUMARA, H. & ADAM, J. P. Notes complémentaires sur la morphologie, la position systématique et la biologie d'*Anopheles* (*Neomyzomyia*) *maliensis* Bailly-Choumara et Adam, 1959. [**Complementary Notes on the Morphology, Systematic Position and Biology of** *Anopheles (Neomyzomyia) maliensis*] *Bull. Soc. Path. Exot.* 1960, Jan.–Feb., v. 53, No. 1, 110–19, 2 figs.

KALMUS, H. & HOCKING, B. **Behaviour of *Aëdes* Mosquitos in relation to Blood-Feeding and Repellents.** *Entomologia Exper. et Applicata.* Amsterdam. 1960, Mar., v. 3, No. 1, 1–26, 5 figs. (1 on pl.) [Numerous refs.]

"About 4,000 females of *Aedes aegypti* (L) and 2,000 of several Canadian species of *Aedes* were studied in the field and the laboratory. Their behaviour in relation to a host and to repellent chemicals was divided into 8 phases and the conditions influencing them as well as the stimuli responsible for the initiation, inhibition, and termination of these phases were investigated; orientation was also considered. The factors studied include surface temperature, convective and radiant heat, light and colour, moisture, wind, odour, taste, gravitation, sound and movement. The relevance of these results for the development of improved mosquito repellent chemicals is discussed."

[The original paper should be studied for the very detailed observations.]

MATTINGLY, P. F. **The Culicine Mosquitoes of the Indomalayan Area. Part IV. Genus *Aëdes* Meigen, subgenera *Skusea* Theobald, *Diceromyia* Theobald, *Geoskusea* Edwards and *Christophersiomyia* Barraud.** 61 pp., 24 figs. [Numerous refs.] 1959. London: British Museum (Natural History). [12s.]

SACHSE, R. Bericht über die Ergebnisse von Grossaktionen zur Stechmücken- und Stechfliegenbekämpfung in den Überschwemmungsgebieten der Niederlausitz des Jahres 1958. [**Results of Control Measures on Mosquitoes and Biting Flies in Flooded Areas of the Niederlausitz Region in 1958**] *Ztschr. f.d.g. Hyg. u. ihre Grenzgebiete.* Berlin. 1960, Jan., v. 6, No. 1, 7–19, 14 figs.

WEIDHAAS, D. E. & SCHMIDT, C. H. **Toxicological Action of DDT on Three Species of Mosquito Larvae.** *J. Econom. Entom.* 1960, Feb., v. 53, No. 1, 106–10, 1 fig.

"In tests by radiometric methods the amount of DDT picked up and its relation to the mortality of fourth-instar larvae of *Anopheles quadrimaculatus* Say, *Aedes taeniorhynchus* (Wied.), and *Aedes aegypti* (L) varied with the exposure time and the concentration. Larvae did not excrete DDT except when exposed to concentrations above the minimum LC-100. The toxic action of DDT on *quadrimaculatus* larvae differed from that on *aegypti*. Resistance to DDT in a strain of *taeniorhynchus* was not related to the uptake or the excretion. Live *quadrimaculatus* larvae absorbed three times as much DDT as dead larvae; however, in a 24-hour test period the surviving larvae had about the same dose as the non-survivors."

SEN, P. **Studies on Insecticide Resistance in Insects of Public Health Importance in West Bengal, India.** *Indian J. Malariology.* 1959, Mar., v. 13, No. 1, 19–33. [33 refs.]

Susceptibility tests on species of the genera *Musca, Anopheles* (8 species), *Aëdes, Mansonia, Culex, Phlebotomus, Xenopsylla* and *Cimex* were carried out according to the Busvine-Nash technique. Only 3 clear examples of resistance were noted: the house-fly, *Musca domestica vicina*, the mosquito, *Culex fatigans*, and the bed bug, *Cimex hemipterus*, all proved to be resistant to DDT. The author does not exclude the possibility that resistance in these instances might be "natural".

All the other insects studied were susceptible to the insecticides (organophosphorus and chlorinated) with which they were tested. *B. C. Fine*

LEWIS, D. J. **The *Simulium neavei* Roubaud Complex (Diptera: Simuliidae) at Amani in Tanganyika.** *Proc. Roy. Entom. Soc. of London.* Ser. B. 1960, Mar. 4, v. 29, Pts. 1/2, 7–10, 15 figs.

"Two members of the *Simulium neavei* Roubaud complex from Amani, Tanganyika, are described. The naming of them and a full discussion of their affinities are deferred until more is known of the complex as a whole."

PARROT, L. & CLASTRIER, J. Notes sur les phlébotomes. LXXIII. Phlébotomes du Tassili des Ajjer (Sahara central). [**Notes on** *Phlebotomus*. **LXXIII.** *Phlebotomus* **from Tassili des Ajjer, Central Sahara**] *Arch. Inst. Pasteur d'Algérie.* 1960, Mar., v. 38, No. 1, 70–78, 2 figs. [42 refs.]

CLASTRIER, J. Notes sur les cératopogonidés. IX. Cératopogonidés de la République du Congo. [**Notes on Ceratopogonids. IX. Ceratopogonids of the Congo Republic**] *Arch. Inst. Pasteur d'Algérie.* 1960, Mar., v. 38, No. 1, 79–105, 19 figs. [16 refs.]

i. HAFEZ, M. & ATTIA, M. A. **Studies on the Ecology of** *Musca sorbens* **Wied. in Egypt (Diptera: Muscidae).** *Bull. Soc. Entom. Egypte.* 1958, v. 42, 83–121, 5 figs. [Numerous refs.]

ii. —— & ——. **On the Developmental Stages of** *Musca sorbens* **Wied., with special reference to Larval Behaviour (Diptera: Muscidae).** *Ibid.*, 123–61, 22 figs. [Numerous refs.]

iii. —— & ——. **The Relation of** *Musca sorbens* **Wied. to Eye Diseases, in Egypt (Diptera: Muscidae).** *Ibid.*, 275–83, 3 figs. [20 refs.]

i. *Musca sorbens* is widespread in Egypt, next in abundance to *M. domestica vicina,* and occurring in towns, country and desert. Although common in markets and slaughterhouses, it seldom frequents houses. It is the predominant fly of open fields and deserts, but is not found in camel droppings in the desert. Its ecology, studied in the laboratory and in the field in Egypt, is reported in this series of papers since its habit of swarming on people, notably the face, eyes, wounds and sores, makes it possibly the main insect disseminator of eye diseases.

Morphological recognition of *M. sorbens,* and its distribution in Egypt and the world are briefly outlined.

Biological particulars include the following points. Breeding occurs most commonly, in the laboratory and in nature, in human stools. Bovine excrement, particularly cakes of buffalo dung made for fuel, and pig dung, are much less often used and excrements of other domestic stock, including camel and fowls, were never found to contain larvae. Latrine dumps, sewage farms, house refuses were also always negative for *M. sorbens* but, together with excrements of stock, these were breeding places of *M. d. vicina.* In the laboratory, oviposition takes place on milk pads and a mixture of wheat bran with water and milk (1 : 2) serves well for rearing larvae

Both species of fly have a main peak of adult abundance in the spring (April) and a lower one in the autumn (August) although swarming on eyes by *M. sorbens* was greatest in June. Only in November to January did *M. d. vicina* exceed *M. sorbens* on faces and eyes. Breeding occurs throughout the year.

Mating lasts about half-an-hour; eggs are laid in 4–9 days at 27°C. and a female may live about 3 weeks laying 3 or 4 batches, totalling only about 80 eggs or so altogether. Optimum temperature for egg laying is about 32°C. Sex ratios were often 1 : 1, with some seasonal variation.

One experiment on releasing marked flies showed them to disperse at least 2 kilometres in 2 hours, and 3 kilometres by 3 days.

Several experiments on colour responses indicate that the alighting flies select white first and then colours at the blue end of the spectrum. Intensity of illumination, however, causes deviations from this choice.

ii. Laboratory studies on the eggs, larvae, and pupa of *M. sorbens* at various temperature and humidity levels are here reported. Eggs hatched in 6·25 hours at 31°–34°C. and 100% relative humidity. Development ceased at 10·1°C. and 5·5°C. was lethal. Optimum conditions for successful hatching were 28°C. and 100% relative humidity. Larval development ceased at 9·2°C., lasted about 11–12 days at 16°C. and to 2½–3 days at 36°C., and appeared at 40°C. to lengthen slightly again. In experiments with choice chambers, larvae preferred humidities near saturation except just before pupation. They were indifferent to wide temperature ranges, although humidity influenced their responses (16°–29°C. at 50% RH; 16°–40°C. in contact with water). The prepupal stage showed less olfactory response to various substances than younger larvae. Pupation lasted as little as 4 days at 36°C.; pupae died at 40°C. Above and below the range 24°–32°C., percentage emergence falls and proportions of deformed adults are greater. [The cycle from egg to adult appears then to be possible within 7–8 days.]

iii. Seasonal incidences of eye disease in children and of *M. sorbens* were similar; in December to January, when *M. d. vicina* was commoner on eyes, ocular infections were fewer. Primitive sewage disposal with much isolated human defaecation was also associated with common occurrence of eye diseases. Experiments elicited choice by flies of pathological secretions from eyes by smell rather than in response merely to moisture. No work was done on aetiology but reference is given to earlier work (De Coursey *et al.*, NAMRU–3 Report, 1956) on *Streptococcus*, *Staphylococcus* and sometimes possibly enteric bacteria isolated from both species of *Musca*, particularly *sorbens* from April to August, and causing most of the ophthalmic conditions in Egyptian children. It is concluded that *M. sorbens* is more important than *M. d. vicina* in the dissemination of eye diseases in Egypt. *D. S. Bertram*

Dunn, P. H. **Control of House Flies in Bovine Feces by a Feed Additive containing** *Bacillus thuringiensis* **var.** *thuringiensis* **Berliner.** *J. Insect Pathol.* New York. 1960, Mar., v. 2, No. 1, 13–16.

"Laboratory studies showed that steers given *Bacillus thuringiensis* var. *thuringiensis* Berliner as an additive in their feed, produced feces which prohibited normal imago development of 92% of the 48-hour-old *Musca domestica* Linnaeus larvae reared in the feces. Most of the mortality occurred in the puparial rather than the larval stage. Feces from control animals in the same experiment allowed development of all but 19% of the fly larvae which were added to them. It is suggested that a toxin rather than a septicemia is the cause of the mortality."

IKESHOJI, T. & SUZUKI, T. **Relationship between Insecticide Resistance in House Flies and the Recovery from Knock-Down.** *Japanese J. Exper. Med.* 1959, Oct., v. 29, No. 5, 481–91, 6 figs. [20 refs.]

LABRECQUE, G. C. & WILSON, H. G. **Effect of DDT Resistance on the Development of Malathion Resistance in House Flies.** *J. Econom. Entom.* 1960, Apr., v. 53, No. 2, 320–21.

It appears that selection of house-flies by regular exposure to malathion can result in development of a strong resistance to DDT; whereas the original development of DDT-resistance (by DDT exposure) did not produce more than low levels of malathion resistance. Nevertheless, it was considered worth experimenting to determine whether this low-level malathion resistance provided a springboard for rapid development of malathion resistance. Accordingly, two strains were subjected to selection by malathion; one a normal colony and one a DDT-resistant strain with low (× 3·5) malathion resistance. At the end of 17 generations the normal colony had less than × 3 malathion resistance, whereas the DDT-resistant colony had reached × 20 to × 40 levels of malathion tolerance. *J. R. Busvine*

SACCÀ, G. Experienze sulla resistenza agli esteri fosforici e resistenza crociata nella mosca domestica. [**Experiences on Phosphoric Esters resistance and Cross Resistance in** *Musca domestica*] *Rendiconti Istituto Superiore di Sanità.* Rome. 1959, v. 22, Pts. 11/12, 1173–88, 1 fig. [14 refs.] English summary.

VAN ASPEREN, K. & OPPENOORTH, F. J. **The Interaction between Organophosphorus Insecticides and Esterases in Homogenates of Organophosphate Susceptible and Resistant Houseflies.** *Entomologia Exper. et Applicata.* Amsterdam. 1960, Mar., v. 3, No. 1, 68–83, 3 figs.

[See also this *Bulletin*, 1959, v. 56, 778 ; 1960, v. 57, 761.]

HADDOW, A. J. & CORBET, P. S. **Observations on Nocturnal Activity in some African Tabanidae (Diptera).** *Proc. Roy. Entom. Soc. of London.* Ser. A. 1960, Apr. 12, v. 35, Pts. 1/3, 1–5, 1 fig. [10 refs.]

"The use of mercury-vapour light in modified Robinson traps has revealed considerable nocturnal activity in some East African tabanids.

"The two commonest species in the catches concerned were *Tabanus par* and *T. thoracinus.* Males and females of *T. par* showed a major peak of activity in the second hour after sunset. Females of the closely allied *T. thoracinus* showed rather similar behaviour, but here the main peak of activity in the males occurred shortly before sunrise.

"Evidence of nocturnal activity above the forest canopy by various tabanid genera, and of swarming just before sunrise in this zone are discussed briefly."

FAIRCHILD, G. B. & AITKEN, T. H. G. **Additions to the Tabanidae (diptera) of Trinidad, B.W.I.** *Ann. Entom. Soc. of America.* 1960, Jan., v. 53, No. 1, 1–8, 2 figs. [12 refs.]

See also p. 947, ŁAWINSKI, Hypodermoza oka u 3-letniego chłopca. [**A Case of Hypodermosis of the Eye of a 3-Year-Old Boy**]

FELDMAN-MUHSAM, B. **The Ticks of Sinai.** *Bull. Res. Counc. of Israel.* 1960, Apr., v. 9B, No. 1, 57–64, 3 figs. [15 refs.]

"Ticks from Sinai taken from domestic stock and wild animals, mostly rodents, were examined. They included specimens of the cosmopolitan species *Rhipicephalus sanguineus*; and of *Hyalomma dromedarii* and *H. excavatum* which are widely spread throughout the Middle East. In addition, representatives of the tick fauna of Asia, Africa and Europe were encountered. *R. rossicus* was recorded for the first time from the Middle East. The male and the female of a new species, *H. sinaii* are described."

CAMPANA-ROUGET, Yvonne. La tératologie des tiques. [**The Teratology of Ticks**] *Ann. Parasit. Humaine et Comparée.* 1959, v. 34, Nos. 1/2 & 3, 209–60; 354–431, 117 figs. [Numerous refs.]

SERDJUKOVA, G. V. [**The Development Cycle of Ticks of the Family Ixodidae**] *Trudy Vsesoyuznogo Entomologicheshogo Obshestva.* Moscow. 1960, v. 47, 273–89, 4 figs. [Numerous refs.]

HUDSON, B. W., FEINGOLD, B. F. & KARTMAN, L. **Allergy to Flea Bites. I. Experimental Induction of Flea-Bite Sensitivity in Guinea Pigs.** *Exper. Parasit.* New York. 1960, Feb., v. 9, No. 1, 18–24. [19 refs.]

"Sensitization of guinea pigs to flea bites, by exposure to the bites of *Pulex irritans, P. simulans* and *Ctenocephalides felis felis*, resulted in a delayed 12 to 24-hour reaction. The development of hypersensitivity and resulting lesions very closely duplicated the early phases of sensitivity in human beings subjected to intradermally injected foreign proteins or to the bites of insects such as mosquitoes or blackflies. The present results differed sharply from the reported results of experimental sensitization of rabbits to the bites of various mosquitoes.

"Guineapigs sensitized to one species of flea as a rule reacted to all flea species used in the experimental work reported here. This would seem to indicate the presence of a common antigenic factor present in *P. irritans, P. simulans* and *C. f. felis*."

HOCKING, B. **An Insect-Proof Doorway.** *Bull. Entom. Res.* 1960, Apr., v. 51, Pt. 1, 135–44, 3 figs.

Details are given and illustrated and the principles and results discussed.

WORLD HEALTH ORGANIZATION. TECHNICAL REPORT SER. No. 191. **Insecticide Resistance and Vector Control. Tenth Report of the Expert Committee on Insecticides. Geneva, 14–19 September 1959.** 98 pp., 3 figs. [Refs. in footnotes.] 1960. Geneva: Palais des Nations. [Sales agent for U.K., H.M. Stationery Office.] [5s. 1d.; $1.00; Sw.fr. 3.–.]

The main work of this session of the WHO Insecticide Committee was devoted to consideration of tests for resistance in different insects. As a result of a suggestion of the WHO Expert Committee on Malaria [this *Bulletin*, 1959, v. 56, 921] attention was focused on " behaviouristic resistance ". Despite some logical objections to this term, it was decided to retain it, because of wide use, to mean a change of reaction of insects after selective action of insecticides. One important type of behaviouristic resistance seems to be increased irritability on contact with insecticides (especially DDT). To detect such changes in mosquitoes a test to measure irritability has been devised, based on the reduction of resting time on DDT deposits. The Committee drew up specifications for a provisional method of detecting this type of behaviouristic change, based on two forms of this test.

As regards tests for measuring susceptibility and detecting resistance, the Committee categorized these as follows: (1) standard tests, recommended for general use; (2) provisional tests, investigated by several different workers but not widely tried in the field; (3) tentative tests, devised and described in detail but not tried except by the originator; (4) promising tests, still under development.

The Committee took action as follows. The instructions of some (existing) standard tests were examined, for purposes of clarification and amplification (and the revised drafts are appended to the Report). Provisional test instructions were drafted for tests with fleas, bed bugs and sandflies (these too are given as appendices). Tentative test methods for cone-nosed bugs and blackfly larvae were considered and recommendations made for their testing by WHO insecticide panel members. Finally the WHO secretariat was requested to expedite the development of promising methods, by appropriate panel members, so far as possible.

Another section of this report concerned development of a standard method for testing aerosols. Three tentative methods were considered and it was recommended that certain panel members be asked to consider these and produce an improved version combining their best points.

The status of pyrethrum in vector control was discussed, especially in regard to the resistance problem. No recommendations were made, other than the publication of summaries of information.

The remainder of the report contains a revised version of the recommendations for vector control. This is based on the appendix to the previous report, a certain number of changes being necessary because of new instances of resistance and development of new insecticides. *J. R. Busvine*

COLONIAL OFFICE. **Colonial Research 1958–1959. Colonial Pesticides Research Committee. Twelfth Annual Report (1958–1959)** [HALL, W. J., Chairman] (pp. 261–80). Cmnd. 938. 419 pp. 1959, Dec. London: H.M. Stationery Office. [18s.]

The report describes the range of subjects under investigation by various research units under the aegis, or otherwise, of the Colonial Pesticides Research Committee, and very briefly indicates the trends of results. There is a list of about 80 papers, or other documents, published or in press on matters within the province of the Committee.

[For Eleventh Report, see this *Bulletin*, 1959, v. 56, 885.] *D. S. Bertram*

FOSTER, R. & POULTON, G. F. **An Apparatus for the Prolonged and Accurate Dispensing of Suspensions and Solutions.** *Bull. World Health Organization.* Geneva. 1960, v. 22, No. 5, 549–54, 4 figs.

BAMI, H. L. & DHATT, M. S. **Studies on Particle Size Distribution in relation to Dispersibility. Part II. 75 per cent Dieldrin Water Dispersible Powders and General Characteristics of Insecticide Water Dispersible Powders.** *Indian J. Malariology.* 1959, June–Sept., v. 13, Nos. 2/3, 131–6, 2 graphs. [10 refs.]

The authors continue studies reported earlier [BAMI *et al.*, this *Bulletin*, 1959, v. 56, 248] on the degree to which commercial insecticide wettable powders meet with suspensibility requirements. From sedimentation experiments they found a close relation between the percentage of the insecticide particles below 10 microns diameter and the suspensibility value as defined in a WHO test. Other characters, such as the nature of the wetting, dispersing and stabilizing materials present, were of secondary importance in new powders or those subjected to accelerated tropical storage tests; though it might be that, on prolonged normal storage, deterioration of the dispersing agents might become important.

In general, all the dieldrin wettable powders were finely ground and approximately equalled the suspensibility of the inert clay fractions. DDT and BHC particles tended to be somewhat coarser.

It should be realized that excessive fineness, while benefiting suspension, increased the rapidity of sorption of the wall deposits on certain types of clay [*ibid.*, 1958, v. 55, 591]. Therefore, it would seem sensible not to strive for suspensibility levels much above the minimum requirement of the WHO test.

J. R. Busvine

MISCELLANEOUS PAPERS

MACARTHUR, W. **The Medical Identification of some Pestilences of the Past.** [Presidential Address.] *Trans. Roy. Soc. Trop. Med. & Hyg.* 1959, Nov., v. 53, No. 6, 423–39.

General Sir William MacArthur in his presidential address to the Royal Society of Tropical Medicine and Hygiene, considers the medical identification of some pestilences of the past.

He begins with the so-called Plague of Athens, 430 to 428 B.C., during the Peloponnesian War, which, after partial cessation for a year and a half, broke

out again in the winter of 427–426 B.C. and continued for a third year. It was not a new disease to the Greeks but was remarkable for its extent and fatality. This epidemic, which is described by Thucydides (II. 47–54) who suffered from it himself, has variously been regarded as bubonic plague, smallpox (Daremberg, Littré, Jeànselme, Zinsser), malaria, scarlet fever or enteric fever. The account, as MacArthur, Raymond Crawfurd and J. D. Rolleston all agree, accords best with typhus.

"It is true that some of the individual signs and symptoms that are listed might well be encountered in other fevers, but there is none that could produce this whole picture; and, moreover, it includes no point that has not been recorded in proved epidemics of this disease." (MacArthur.)

The inhabitants of Athens were no strangers to lice, Aristophanes relates. The insect vectors of typhus and of relapsing fever and the conditions in the besieged city would soon favour a "concentration of contagion" (Pringle) that would cause mild typhus to assume its malignant petechial character with a high mortality. The diagnosis of typhus is established beyond all question by the gangrene that, says Thucydides, "would often seize the extremities".

Brief reference is next made to the plague which broke out in A.D. 542 in the reign of the Emperor Justinian. It was undoubtedly bubonic plague and was well described by the Greek historian Procopius, who saw its ravages in Byzantium. The Justinian plague devastated Europe and far beyond it. The resulting devastation and dearth prepared the way for another pestilence. This was called the *Pestis Flava* in Latin; the *Buidhe Chonaill* and the *Crón Chonaill* by the Irish annalists, on whom General MacArthur is a well-known authority; and the *Fad Felen* by the Britons: all these names meaning the Yellow Plague. Some late compilers confused this with the Justinian plague. General MacArthur adduces cogent arguments that this widespread and fatal epidemic, accompanied by jaundice, was due to relapsing fever, which at times may assume a virulent character, as in the calamitous epidemic which began in North Equatorial Africa in 1921. The earliest record of relapsing fever is of an epidemic in Thasos given in the *Hippocratic Collection*. The Yellow Plague could not have been infective hepatitis, because of its low death rate which would not interest the annalists; nor could Weil's disease, because of its restricted method of spread from rats, give rise to a generalized epidemic in Britain and Ireland.

The next epidemic discussed is "the so-called yellow plague of A.D. 664". Bede gives an account of it in his *Ecclesiastical History*, and it is mentioned in the *Anglo-Saxon Chronicle* as "a great plague in the island Britain, in which died Bishop Tuda who was buried at Wayleigh". This was an outbreak of bubonic plague. It spread to Ireland and two of its kings died from it. General MacArthur observes that it was never supposed to be a second visitation of the yellow plague until some scribe, long after the event, erroneously inserted the name as a retrospective gloss.

There is an interesting account of the famine-fevers of Mediaeval Europe, and "the Fever that is called the Ague". The "Irish ague" that wrought havoc in Ireland during the Cromwellian and later wars was typhus and not malaria. These old famine-fevers are described in terms too general to allow of any positive diagnosis on clinical grounds. The earliest clinical description of typhus, which includes the rash, dates from the middle of the sixteenth century.

But the whole picture is exactly that of the famine-fevers (typhus) which after ceasing in England, continued at intervals in Ireland until a century ago.

Finally, General MacArthur notes that in the Annals of Ulster there is a strange entry under the year A.D. 708 (*recte* 709) of an outbreak of "the pestilence that is called *baccach*—*i.e.*, the lameness". He reasonably concludes that this is the first description of an epidemic of poliomyelitis. [Acute poliomyelitis appears to have existed from very early times. Osler in the earlier editions of his textbook of medicine cited Mephibosheth, the son of Jonathan (2 Samuel, iv, 4), "who was lame on both his feet", as an example of the disease. "Since the days of Mephibosheth", wrote Osler, "parents have been inclined to attribute this form of paralysis to the carelessness of nurses in letting the children fall, but very rarely is the disease induced by traumatism." The recognition of poliomyelitis as an epidemic disease has been extraordinarily slow; and even to-day the epidemic characteristics are not always fully appreciated.]

The whole of General MacArthur's presidential address constitutes a scholarly contribution to knowledge and identification of these early pestilences.

Arthur S. MacNalty

BARNARD, C. C. **Medical Libraries in Britain.** *Central African J. of Med.* 1960, Apr., v. 6, No. 4, 156–60.

This paper has interest for readers of this *Bulletin* for two reasons. It is written for practitioners in an area where library facilities are being expanded as quickly as limited resources will allow; but where it is unlikely that the great bulk of older medical literature will ever be available. The author has, therefore, reviewed the resources available in Britain and has given the broad coverage of medical libraries, both general and specialized in scope. This will enable the practitioner in the tropics to write for assistance to the most appropriate library in this country; or, when visiting Britain, to plan his work appropriately. The author also reviews the services available to readers and cooperation between libraries.

Secondly, Cyril Barnard will be remembered with affection by many readers of this *Bulletin* as the Librarian of the London School of Hygiene and Tropical Medicine from 1921 until his accidental death in 1959. He built up the library to its present wide coverage and organized the incorporation into it of the library of the Bureau of Hygiene and Tropical Diseases. *V. J. Glanville*

NORMAN-TAYLOR, W. **Health Services in Nigeria and the Use of Auxiliary Personnel.** *Pub. Health.* 1960, Apr., v. 74, No. 7, 253–60.

The author recently spent 3 years in Nigeria as WHO Adviser on Education and Training. Much of the paper is a description of the sanitary state of the towns and of the rural health services. The main point is the training of auxiliary personnel, a term which is used to denote workers in a technical field with less than full professional training in that field. The author could not give more than an outline in this short paper, but he suggests that the place of auxiliaries in the general plan should be more clearly defined, and that the training programme should be designed to fit in more exactly with what is required of these people. Training methods need revision, and the importance of learning

on the job should be remembered. Training schools for the different aspects of rural health might be brought under one roof. *Charles Wilcocks*

TETTEY, C. **A Brief History of the Medical Research Institute and Laboratory Service of the Gold Coast (Ghana) 1908–1957.** *West African Med. J.* 1960, Apr., v. 9 (n.s.), No. 2, 73–85. [10 refs.]

This is a short account of the Medical Research Institute, which is the direct descendant of the Accra Laboratory established in a room of the Government School, James Town, Accra, in 1908 by Professor W. J. Simpson, when plague was present in the area. Later a more suitable building was found at the Colonial Hospital.

Many illustrious men have been connected with this laboratory—Macfie, Ingram and Corson among the earliest, and W. A. Young who was later to die of yellow fever contracted when he performed the autopsy on Noguchi there. It was from this place as headquarters that Mahaffy was working when he isolated the famous Asibi strain of yellow fever virus, the parent of 17D.

The author gives an account of the process of development to the end of 1956 when, with Edington in charge, the Institute had a large staff. When Ghana was declared independent in the following year the service, with the exception of the 2 pathologists and the temporary biochemist, was almost completely composed of Africans; the Institute was then better housed and equipped than at any time in its history.

A long list of published papers testifies to the value of the work done at this famous Institute. *Charles Wilcocks*

REPORTS AND SURVEYS

EAST AFRICA HIGH COMMISSION. **East African Virus Research Institute, Entebbe. Report No. 9, 1958–59** [GILLETT, J. D., Acting Director]. pp. ii + 49, 2 figs. 1959. Nairobi: Govt. Printer. [Sh. 5.]

Preliminary identifications of new virus isolates from human sera are: one (Nakiwogo) which may be, possibly, related to Wesselsbron and one (Kisubi) to Bunyamwera virus: a third (Semunya) could not be identified. The first proved isolations of Chikungunya and yellow fever virus from human material from the Belgian Congo, causes of recent epidemics there, are noted. No virus was isolated during the year from 30,000 wild-caught mosquitoes of various species, predominantly *Mansonia*, from several Uganda forests. Antibody surveys in human sera continue, involving tests against 10 viruses; only West Nile failed to give positive results. Surveys on 63 bird sera were negative for Chikungunya virus; positive results with hippopotamus sera were obtained against 5 well studied viruses, interpretation being cautious. Experimental work is reported on Nairobi sheep disease vaccine, Rift Valley fever virus in hamsters and EMC virus in lower primates. A clinical account of a laboratory infection of

Wesselsbron virus in one of the European staff is given in some detail. Certain symptoms were unique. Chlorothiazide was given effectively to relieve severe headache.

Entomological researches of various kinds have been pursued. Notable is the report of first results from the steel tower now erected in Mpanga forest, near Entebbe. It extends by about 60 ft. above the main forest canopy and has platforms at 30 ft., 60 ft., 90 ft. and 120 ft.—at the top. This has at last given the Institute the chance to study insect (particularly adult mosquito and tabanid) behaviour above canopy level. Standard meteorological data are kept, with interesting comparative findings about wind as well as other factors, at all levels. There is, notably, a lull in wind in the canopy at sunset and dawn, a period important in much mosquito behaviour. Mosquitoes swarm above canopy level—indeed over the tower—mainly at dusk, tabanids only, so far, at dawn, swarms being almost always of males. Rising thermal currents at sunset carry insect swarms well above canopy level and this may have epidemiological importance with vector species. Mpanga Forest is, however, disappointingly lacking in *Aëdes africanus* and there are thoughts of transferring the tower to a more typical forest. Breeding behaviour as observed in bamboo pots on the tower, besides biting activity of females, and more general activity (based on more predominantly male catches with a mercury-vapour light) are being studied.

Mosquito work in other forests also continues along more orthodox lines. A male of *Aëdes africanus* is the first taken in nature by the Institute. Rock pool and tree-hole breeding of *Aëdes aegypti* (mainly referable to ssp. *formosus*, a few as type form) is confirmed for Kaimosi Forest in Kenya. A considerable body of work is obviously in progress on means of age-grading mosquitoes and on the application of several methods to studies of age-composition of mosquito populations in relation to vertical distribution in forests, 24-hour cycles and seasonal changes in populations. Some other topics discussed include host preferences of *Aëdes aegypti* and other species and genetic analysis of morphology and behaviour in wild populations of the former.

The Institute's technique for the mouse protection test and its interpretation is set out and discussed.

The strength of numerous animal colonies is given. Interest in virus work in birds is supported by a new small aviary and attempts to breed jungle fowl as a laboratory material. The Lagos and Newala strains of *Aëdes aegypti* have been discarded by intention, and the Ilobi, Ganda and Bunono strains introduced as laboratory materials. *Aëdes apicoargenteus* was bred successfully in the laboratory from wild-caught, gorged females; it feeds readily enough on mice but appears not to mate in small cages.

[For Report No. 8, see this *Bulletin*, 1959, v. 56, 781.] *D. S. Bertram*

BOOK REVIEWS

CHRISTOPHERS, S. Rickard [C.I.E., O.B.E., F.R.S., I.M.S. (retd.)]. *Aëdes aegypti* **(L.) the Yellow Fever Mosquito: its Life History, Bionomics and Structure.** pp. xii + 739, 86 figs. 1960. London: The Syndics of the Cambridge University Press, Bentley House, 200, Euston Road, N.W.1. [75s.]

The publication early this year of Sir Rickard Christophers' book on *Aëdes aegypti* is an event which has been awaited with great interest. The expectations of a further significant contribution from one whose researches on mosquitoes, besides related and other aspects of medical science, have been of first importance over some 60 years have certainly been rewarded. The book must command a place of lasting distinction and value in medical entomology. It is far from being a compilation from a vast literature. It is particularly noteworthy for its content of new information, previously unpublished, from the author's own researches.

Of the 31 chapters, the first 4 together take up only 100 pages and in this limited space a considerable number of topics are discussed. Some, such as historical aspects, distribution, general biology—including enemies and parasites of *Aëdes aegypti*—are more complete than others which have become quickly imperfect as new knowledge so rapidly accumulates. Nevertheless, systematics include the concept of *Aëdes aegypti* comprising the type form, ssp. *formosus* and var. *queenslandensis*. Medical aspects emphasize yellow fever and dengue and briefly comment on relationships of other viruses known up to 1955, as well as filariasis and avian malaria. On control, there are short accounts of anti-adult and anti-larval measures by various means including DDT, disinfection of aircraft, and protective measures by screening and repellents. Elsewhere, in a chapter which discusses factors affecting viability, the use and characteristics of contact insecticides and repellents are more fully treated. The fact of DDT resistance in *Aëdes aegypti* in Trinidad is incorporated in the text and principles of insecticide resistance are set out. The reader is, moreover, provided by footnotes and addenda with references to some of the general works on insecticides and the resistance phenomenon, up to 1957, and in these ways some of the limitations in this section are off-set. These methods of supplementing reference lists are also used elsewhere in the book.

Essentially, however, the main body of the book is less affected by this problem, being about *Aëdes aegypti* itself—the external and internal structure, including histology, physiology and behaviour of the female, male and the immature stages. There are 3 chapters on the egg, 6 about the larva, 2 about the pupa and 15 on the adult, the last comprising the greater part of half the book—over 300 pages. The morphology and physical characteristics of the egg and its physiological features and viability are very fully studied, followed by a chapter on the mechanism of eclosion and factors affecting its occurrence and success. Embryology is described in another chapter but for *Culex molestus*, the eggs of *Aëdes aegypti* proving a technically troublesome material although, so far as studied, conforming with processes observed in *Culex*. The minuteness of detail in these studies is remarkable, based in great part on original investigation or re-examination of material by the author, and this holds

true again throughout the several chapters on the external and internal structure of the larva, pupa and both sexes of adults. The book, for example, is believed to contain the first detailed description of the brain of a mosquito—and throughout its development in the life-cycle stages. This progressive tracing of organs and their functional role is often the thread of continuity between chapters. It is for this aspect of the subject that the line-drawings are so profuse. Most of the 86 figures contain several individual drawings so that the total illustrations must be about 600 or more. Sections are numerous. Some drawings of pattern and postures in adults combine delightfully both precision and artistic delicacy. Complexes such as tracheal, nervous and muscular systems are readily related in figure and text by corresponding numbers, the text also summarizing against these numbers the main features of each element of the system. [Fig. 74 on the musculature of the adult does not include a figure of the abdomen to which text reference is made—Muscle 11, on p. 621.]

Chapters on biological aspects are concerned with larval environment and the behaviour and responses its factors invoke, growth characteristics, and pupal life. For the adult, separate chapters deal with food and feeding; numerous aspects of the blood meal, including reactions to bites; mating and oviposition; the mechanics and physiology of flight, together with haltere function; special sense organs and their functions in response to stimuli. Viability under different conditions is a subject recurring for the different stages, but for the adults is accorded a separate chapter. The concluding chapter is on several aspects of physiology and includes some account of mosquito chromosomes and genetics, hormones, reserves in different physiological phases of mosquito life, and traces the main features of respiration, digestion and circulation through larva to adult.

Since so much that is new in the book, on structure and on function, stems from Sir Rickard's own researches with his laboratory culture of *Aëdes aegypti*, the fifth chapter, on technique, proves a valuable statement of effective methods for rearing, handling and sectioning. This is amplified by a useful bibliography to other methods, including special ones which he did not himself use. A characteristic of the book is that, in addition to this chapter, there are interpolations throughout of informative accounts of techniques and procedures he employed for particular types of observation, sometimes on morphology but usually concerning biology and behaviour.

In addition to the illustrations referred to, a map of world distribution of the species is given and there is much detailed biological data in about 50 tables and some charts—mostly, again, the author's original data. References are given in classified sections at the end of each chapter. Allowing for repetition of certain references relevant to several sections, the overall list must amount to, perhaps, 2,000 different titles.

Strictly separate treatment of morphology and function is neither wholly possible nor desirable. The arrangement of chapters tends to divide these disciplines conveniently in general, but the reader should be ready to seek his information at more than one point in the book. In this he will be assisted by the index, the opening table of chapter contents and periodic cross-references in the text.

This is a book which all who work with *Aëdes aegypti*, or other mosquitoes, must find a remarkably valuable source of information, drawn from the literature on this and other species, and of first importance for its substantial amount

of original data. Its significance is greater for those who view *Aëdes aegypti*, or other mosquitoes, as experimental animals than for those who are concerned in the practical management of mosquito control.

It is a fairly large book, 11″ × 7½″ and nearly 2″ thick, well bound, with print easy to read and illustrations, some intricate, clear. *D. S. Bertram*

SHUTE, Percy G. [M.B.E., F.R.E.S.] & MARYON, Majorie E. [F.R.E.S.]. **Laboratory Technique for the Study of Malaria.** Foreword by Gordon COVELL, C.I.E., M.D., D.P.H. pp. x + 86, 25 figs. 1960. London: J. & A. Churchill Ltd., 104, Gloucester Place, W.1. [10s. 6d.]

In this useful, small and handy volume the authors give a very full and helpful account of the techniques employed in the laboratory study of malaria. The techniques described are those that have been in use at the Malaria Therapy Centre, Horton, now the Ministry of Health Reference Laboratory, of which the senior author has been in charge since its inception 33 years ago. He has been assisted during the last 21 years by the co-author. The Horton Laboratory had its beginnings in arrangements made by Lt.-Col. S. P. JAMES, Adviser on Tropical Diseases to the Ministry of Health, for the treatment by malaria therapy of neurosyphilis and some other conditions. Up to date, as noted in the short preface to the book, more than 13,000 patients have been infected by one or other of the four human malaria parasites, involving the use of some 100,000 *Anopheles* mosquitoes, mostly reared at Horton. The laboratory has also for many years been one of the most important centres of research on the human malaria parasites and human infection by these. It was the unique facilities alone provided by Horton for rearing and infecting large numbers of mosquitoes that enabled the first proof of the exo-erythrocytic cycle of the malaria parasite to be made. The laboratory too has been a source from which many other laboratories and research workers in Great Britain and other countries have been provided with material, particularly mosquito cultures, including recently the very useful species for laboratory work *Anopheles stephensi*, which was first cultured in Britain at Horton from material sent from India. In all this work the authors of the book have played a major part, as will be clear from their publications listed in the bibliography at the end of the work. In making available in a clear and simple form the many techniques involved the authors have rendered a valuable service to research in many fields.

After the foreword by the Director, Sir Gordon Covell, Adviser on Malaria to the Ministry of Health, and a short preface, the book consists of four sections, followed by a selected bibliography and index. Section 1 deals with the preparation and staining of blood films in malaria work. Very full descriptions are given of the various points in the making, fixing and staining of thin and thick films, the preparation of stains, precautions to be taken and much that will be very helpful to the beginner, and indeed to the experienced worker. As an example may be noted what is said about the use of Leishman's stain for certain purposes. In the early days of staining blood films for malaria parasites Leishman's stain was largely used. But for some time now Giemsa's stain (or forms of this) have become the general routine. But as the authors of the book explain, Leishman's stain has some important features that Giemsa lacks, and

what these are, and when and how to get them, and why these are important, is all very fully given. In the section, too, are useful details regarding the *p*H of water used for diluting the stains. The beginner—he may be in charge of a laboratory where he is expected to stain and identify slides for malaria parasites—reads that the *p*H of water should be 7·2, which sounds a complication. But the simple account of the procedure (and precautions) for arranging for this, besides explaining reasons for what is given, shows that what is required may be very simply done.

Section 2 gives a very full account of the technique of dissection of the salivary glands and stomach of the mosquito with that required for the demonstration and identification of oöcysts and sporozoites. Here too are given methods of sectioning and staining sections of mosquitoes to show oöcysts and sporozoites, the technique of the induction of malaria by intravenous injection of sporozoites, the obtaining and examining of post-mortem and biopsy material and much else.

Section 3 deals with the establishment and maintaining of colonies of *Anopheles* in the laboratory. The remarks made in this section are perhaps some of the most important in the book, having relation to recent research in the fields of genetics and study of insecticide resistance. The authors note that at Horton there have now been maintained for many years continuous cultures of *A. maculipennis* var. *atroparvus* [*A. labranchiae atroparvus*] and *A. stephensi* that have never come in contact with any insecticide and from which the laboratory has supplied numerous workers with virgin material of known origin. In this section are given the methods used in starting and maintaining colonies with many valuable details in such matters as the use of Nembutal in the feeding of mosquitoes on laboratory animals, feeding on the human subject and the keeping of mosquitoes under suitable conditions.

Lastly in Section 4 is a list, covering some 6 pages, of practical hints. Here are given many valuable tips and descriptions of some simple pieces of useful apparatus. One of these, with a photograph, is a most useful teak board capable of holding up to half a gross of slides set to dry or for other purposes.

The figures include photographs of apparatus, a very clear drawing showing dissection of the salivary glands and four page drawings giving the characters of the early oöcysts of the four human malaria parasites.

The book is one that should be especially valuable at the present time when work in the detection of malaria cases, studies of plasmodia of man and animals, research on insecticides, on mosquito genetics and other subjects will be engaging many workers in addition to those in clinical laboratories where material for diagnosis may well include requests for blood examination of suspected malaria cases. *S. Rickard Christophers*

YAMAGUTI, Satyu. **Systema Helminthum. Vol. I. The Digenetic Trematodes of Vertebrates—Part I.** pp. xi + 979. **Part II.** pp. 981–1575, numerous illustrations. 1958. [$90.00] **Vol. II. The Cestodes of Vertebrates.** pp. vii + 860, 584 figs. on 70 pls. 1959. [$90.00.] New York 1: Interscience Publishers, Inc., 250, Fifth Avenue, N.Y. London: 88–90, Chancery Lane, W.C.2.

The vast literature on the systematics of the digenetic trematodes of vertebrates up to the year 1955 is brought together and classified in the first volume

of this monumental work by Professor Yamaguti, a two-part volume totalling over 1,500 pages. This is the first of a series of three volumes dealing respectively with the digenetic trematodes, the cestodes and the nematodes of vertebrates, under the common title *Systemà Helminthum*. Helminthologists will be profoundly grateful to him for undertaking and completing this enormous task which will also command their admiration.

The first part, of 979 pages, contains the main text. The second contains the bibliography, illustrations and index; it also lists all the genera of digenetic trematodes under their respective families and subfamilies and indicates the group or groups of hosts to which they belong, *i.e.*, mammals, birds, reptiles, amphibians and fishes.

In Part 1 the system followed is primarily a host grouping, beginning with the trematodes of fishes, and within each group there are descriptions and keys to families, subfamilies and genera. The species of each genus are listed with remarks on host-range, life cycles and distribution. The link-up between Part 1 and the illustrations in Part 2 is by reference to the plate number and figure, which is in most cases a picture of a genotype. 8 new families are included in the descriptions; there are also 168 new subfamilies, 22 new tribes and 24 new genera.

In a work of this kind some features are bound to be criticized. There will be differences of opinion about the scheme of classification. The separation of the illustrations from their corresponding descriptions is rather inconvenient though doubtless saving in space and expense. The illustrations, 1,302 of them, are in some cases over-reduced and lacking in clarity; there are no scales of magnification. The grouping of the parasites under hosts also has its disadvantages but good reasons are given for it and it will be appreciated by the field worker. These " defects " are of small account however when aligned with the incomparable usefulness embodied in this notable work.

Volume II, which deals with the cestodes of vertebrates, follows the same pattern as in Volume I, but the information is confined to a single book of 860 pages. In this there are 7 new families, 4 new subfamilies and 30 new genera. There are 70 plates of illustrations which cover 584 species. It is subject to the same kind of criticism as Volume I, but here again we are presented with a much-needed reference work of great value and importance.

J. J. C. Buckley

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